4.7 BIOLOGICAL RESOURCES - MARINE

This subsection describes existing marine habitat and plant and animal species in the proposed Cabrillo Port project area. Potential impacts on marine ecology from all phases of the proposed Project are identified, and related concerns raised during the public scoping period are addressed within this subsection. Public concerns that were raised include potential liquefied natural gas (LNG) spills that may affect fish or other marine life; impingement and entrainment (entrapment) of fish or other marine organisms in water-cooling intake systems; thermal pollution and lighting that may cause changes in marine mammal, sea turtle, or marine bird behavior or cause harm to individuals; disturbance of contaminated sediments that could potentially affect water quality and harm marine life and marine environments; potential impacts to marine life such as migrating whales caused by noise or entanglement during Project installation; and impacts on special status species and protected areas. This subsection also contains mitigation measures for each potential impact and an evaluation of the proposed alternatives' impacts on marine biology.

4.7.1 Environmental Setting

4.7.1.1 Marine Benthic Communities: Invertebrates

Intertidal Benthic Communities

The terrestrial-marine interface represents a transition zone between fully terrestrial systems (see Subsection 4.8, "Biological Resources—Terrestrial") and fully marine systems. This interface is characterized by species from both systems. The discussion below includes marine communities in the intertidal systems (sandy beaches and rocky shores) and in shallow subtidal areas frequently affected by wave and tidal action.

Sandy Beaches

Between 66 to 93 percent of the Southern California coastline comprises sandy beaches. Sandy beach communities generally support between 11 to 37 species, predominately crustaceans, mollusks and polychaetes. Populations may range from 3,360 to 88,500 individuals per square meter of beach, with the majority supporting an invertebrate biomass between 6.72 and 13.44 pounds per foot (lb/ft) (10,000 and 21,000 grams per meter [gm/m]) (Dugan 2000). Organisms that reside in this environment have adapted to its dynamic nature by being highly mobile, exhibiting tidal, semilunar, or seasonal patterns of movement. Invertebrates that inhabit sandy and nearshore beaches provide food for fishes and shorebirds.

The invertebrate communities on a sandy beach can be correlated to slope, sand texture, and the presence of macrophyte wrack. Macrophyte wrack consists of organic debris, including kelp, algae, sea grasses, and marine organisms that wash up on the shoreline. This collection of detritus serves as a food source and protection from predators and desiccation for many marine organisms and seabirds. It supports a diverse fauna of insects and crustaceans, primarily beetles and kelp flies, talitrid

amphipods and isopods such as *Tylos punctatus*. Ormond Beach receives naturally low quantities of macrophyte wrack and thus supports a less diverse community of invertebrate species than do other southern California beaches with high wrack input. Dugan et al. (2000) reported between 15 and 22 species of macrofaunal invertebrates from Ormond Beach.

On sandy beaches, each tidal zone (upper, middle, and lower) supports specific species of invertebrates. Common invertebrates in the upper intertidal zone include amphipods species in the genus *Orchestoidea*; the predatory isopod, *Excirolana chiltoni;* and several species of polychaetes (e.g., *Excirolana chiltoni, Euzonus mucronata,* and *Hemipodus borealis*).

The middle intertidal is characterized by species such as the sand crab, *Emerita analoga*, and the polychaete, *Nephtys californiensis*. Sand crabs are generally the most abundant of the common middle intertidal organisms, often comprising over 99 percent of the individuals on a given beach (Dailey et al. 1993).

In the lower intertidal zone, polychaetes and nemerteans dominate (Straughan 1983). The large sand crab (*Blepharipoda occidentalis)*, the Pismo clam (*Tivela stultorum),* and the bean clam (*Donax gouldii*) are also found in the lower intertidal. *Tivela*, however, was once more abundant in the intertidal, and Pismo clam populations have been highly variable throughout the years and from beach to beach (California Department of Fish and Game [CDFG] 2001).

Rocky Shores

Diverse assemblages of algae, invertebrates, and fish characterize California rocky intertidal areas. Rocky intertidal areas near the Project site are limited to breakwaters, piers, and jetties. These structures occur at the entrance to Port Hueneme, north of the Project shore crossing, but not in the immediate area surrounding the Project site.

Kelp Beds

Giant kelp (*macrocystis pyrifera*) is known to exist intermittently along the Southern California coast and provides important structure and habitat for numerous species of fish, invertebrates, birds, and marine mammals. Giant kelp generally lives on rocky substrates from depths of 20 to 98 feet (6 to 30 meters [m]) depending on water clarity. The lack of natural hard-bottom substrates at the proposed Project site at these depths would not provide suitable habitat for kelp beds. There are no known kelp beds or hard substrata habitat within the proposed Project site (Entrix 2004).

Subtidal Benthic Communities

Offshore subtidal benthic communities include infaunal communities occurring in soft substrata (sands and muds), and epifaunal communities on both hard and soft substrata. There are no known hard substrata subtidal benthic habitats in the Project site. Along the pipeline route, the sediments of the continental slope and basin floor consist predominantly of fine sands and muds. These soft substrate communities are

described below. According to recent surveys of the proposed Project site, including pipeline routes to shore and the floating storage and regasification unit (FSRU) mooring location, no hard bottom habitats occur within the Project site (Fugro 2004).

Infauna

Bergen et al. (1998b) identified four major benthic infaunal assemblages based on cluster analysis of the macroinfaunal data. These assemblages consisted of a shallow water assemblage found between 32-foot to 105-foot (10 to 32 m) depths, an intermediate depth assemblage found between 105 to 377 feet (32 to 115 m) deep, a fine-sediment deep assemblage, and a coarse-sediment deep assemblage. Bergen et al. (1998b) found that depth was the dominant influence on community structure, with grain size exerting a secondary effect. A summary of the dominant species in each of the benthic infaunal assemblages on the continental shelf is provided in Table 4.7-1. The number of taxa and total abundance of organisms were greatest in the mid-depth habitat and lowest in the shallow habitat.

Table 4.7-1 Average Abundance of Species (organisms/square meters [m^2]) with Frequency of Occurrence Greater than 60 Percent and Average Abundance of at least 20/m^2 in Each Group

Species	Taxonomic Group	Deep Coarse	Deep Fine	Mid-Depth	Shallow
Spiophanes missionensis	Annelids	386.0	195.0	563.2	132.2
Amphiodia digitata	Ophiuroidea	236.0			
Euphilomedes producta	Arthropoda	215.0			
Mediomastus spp.	Annelida	168.0	71.6	117.8	76.2
Chloeia pinnata	Annelida	100.0			
Amphiodia urtica	Ophiuroidea	83.0	263.2	422.0	
Spiophanes firnbriata	Annelida	82.0	149.7		
Ampelisca careyi	Arthropoda	69.0	21.0		
Photis lacia	Arthropoda	69.0			
Rhepoxynius bicuspidatus	Arthropoda	59.0		43.0	
Maldanidae*	Annelida	51.0	91.5	105.0	127.9
Pectinaria califomiensis	Annelida	50.0	91.1	85.3	
Eudorella pacifica	Arthropoda	35.0			
Lumbrineris spp.	Annelida	35.0	94.0	50.8	57.5
Paraprionospio pinnata	Annelida	33.0	47.8	45.4	108.9
Euclymeninae sp. A	Annelida	31.0		28.2	
Decamastus gracilis	Annelida	21.0			
Terebellides califomica	Annelida		23.0	20.2	
Maldane sarsi	Annelida		34.0		
Levinsenia spp.	Annelida		30.3		
Cossura spp.	Annelida		26.9		

Table 4.7-1 Average Abundance of Species (organisms/square meters [m^2]) with Frequency of Occurrence Greater than 60 Percent and Average Abundance of at least 20/m^2 in Each Group

Species	Taxonomic Group	Deep Coarse	Deep Fine	Mid-Depth	Shallow
Laonice appelloefi	Annelida		21.8		
Sthenelanella uniformis	Annelida			84.2	
Phoronis sp.	Phoronida			77.9	
Prionospio sp. A	Annelida			76.4	
Ampelisca brevisimulata	Arthropoda			50.2	31.6
Euphilomedes carcharodonta	Arthropoda			47.5	
Paramage scutata	Annelida			46.4	
Parvilucina tenuisculpta	Mollusca			44.0	
Leptochelia dubia	Arthropoda			42.3	
Heterophoxus oculatus	Arthropoda			37.6	
Pholoe glabra	Annelida			28.0	
Glycera nana	Annelida			26.7	
Tellina carpenteri	Mollusca			24.4	
Gnathia crenulatifrons	Arthropoda			24.2	
Tubulanus polymorphus	Nemertea			23.2	
Ampelisca pugetica	Arthropoda			22.2	
Amphideutopus oculatus	Arthropoda				132.9
Glottidia albida	Brachiopoda				90.3
Spiophanes bombyx	Annelida				82.6
Ampelisca cristata	Arthropoda				65.1
Macoma yoldiformis	Mollusca				54.8
Tellina modesta	Mollusca				50.8
Apoprionospio pygmaea	Annelida				50.0
Owenia collaris	Annelida				44.7
Amphicteis scaphobranchiata	Annelida				24.8
Carinoma mutabilis	Nemertea				24.3
Ampharete labrops	Annelida				23.4
Rhepoxynius menziesi	Arthropoda				22.2
Lineidae	Nemertea				20.3

*All Maldanids except 11 identified species.

Source: Bergen et al. (1998b)

Epifauna

Epifaunal mega-invertebrate populations varied significantly by region, depth, and proximity to outfalls. Three regions were identified: the northern region (Point Conception to Point Dume), the central region (Point Dume to Dana Point), and the southern region (Dana Point to Mexico). Depth intervals considered included the inner shelf (33 to 82 feet [10 to 25 m]), the middle shelf (82 to 328 feet [25 to 100 m]) and the outer shelf (328 to 656 feet [100 to 200 m]).

In the deep basins of the Southern California Bight, the biological community shows a dramatic change in species composition and structure. According to Thompson et al. (1993), the floor of the Santa Monica Basin (2,345 to 2,880 feet [715 to 878 m] in depth) is largely devoid of macrofauna, with live organisms collected from approximately only 26 percent of the sites sampled. About eight species of megafaunal animals have been collected from the floor of the Santa Monica Basin. The dominant species are the galatheid crabs *Munida quadrispinosa* and *Munidopsis hysterix* (Thompson et al. 1993).

Special Status Invertebrate Species

White Abalone (*Haliotis sorenseni*) – Federal Endangered

The white (Sorensen's) abalone usually occurs at depths from 66 to 200 feet (20 to 61 m) (Hobday and Tegner 2000), although some have been found in water as shallow as 15 feet (4.6 m) (Cox 1962; Howorth 1962-2004). White abalone have not been reported at or near the proposed Project site, nor have any other species of abalone. Considering the lack of suitable hard substrate for abalone and for the algae upon which they feed, the likelihood of white abalone being present is extremely remote.

4.7.1.2 Marine Fishes

Common Marine Fish Species

Distribution and abundance of fish species can be strongly influenced by substrate, depth, and seasonal, annual, and decadal changes in water temperature, including El Niño events. The sandy or muddy intertidal areas are home to leopard sharks, rays, croakers, mullet, and surfperches (Leet et al. 2001). In the sandy or muddy shallow subtidal habitats, sportfishes including surfperches, California corbina, California halibut, sanddabs, yellowfin croakers, and young white seabass are common (Leet et al. 2001). Deep soft sediment areas are home to a wide variety of fishes, including rockfishes, flatfishes, and shrimp.

Fishes common to the vicinity of the Project vary according to water depth, dominant substrate and habitat. Habitats vary from the narrowly distributed shoreline to open water areas to waters more than 2,730 feet (832 m) adjacent to the Floating Storage and Regasification Unit (FSRU). Common fishes in and around the area are described in Table 4.7-2.

Table 4.7-2 Fish Common to the Project Vicinity Based on Habitat and Water Depth

Common Name	Scientific Name	Soft Bottom 0 to 82 feet (0 to 25 m)	Soft Bottom > 82 feet (> 25 m)	Hard Bottom 0 to 82 feet (0 to 25 m)	Hard Bottom > 82 feet (> 25 m)
Bass, barred sand	*Paralabrax nebulifer*	X	X		
Bass, kelp	*Paralabrax clathratus*			X	X
Bass, spotted bay	*Paralabrax maculatofasciatus*	X	X	X	X
California corbina	*Menticirrhus undulatus*	X			
Cowcod	*Sebastes levis*		X		X
Croaker, yellowfin	*Umbrina roncador*	X	X		
Croaker, white	*Genyonemus lineatus*	X	X		
Garibaldi	*Hypsypops rubicundus*			X	
Grunion, California	*Leuresthes tenuis*	X			
Guitarfish, shovelnose	*Rhinobatos Productus*	X			
Halibut, California	*Paralichthys californicus*	X	X		
Halfmoon	*Medialuna californicus*			X	X
Opaleye	*Girella nigricans*			X	X
Ray, bat	*Myliobatis californica*	X	X		
Rockfish, black	*Sebastes melanops*	X	X	X	X
Rockfish, blue	*Sebastes mystinus*			X	X
Rockfish, bocaccio	*Sebastodes paucispinus*	X	X	X	X
Rockfish, calico	*Sebastes dalli*		X		X
Rockfish, kelp	*Sebastes atrovirens*			X	X
Sanddab, Pacific	*Citharichthys sordidus*		X		
Sanddab, speckled	*Citharichthys stigmaeus*	X	X		
Scorpionfish, California	*Scorpaena guttata*	X	X	X	X
Seabass, white	*Atractoscion nobilis*	X	X	X	X
Shark, leopard	*Triakis semifasciata*	X			
Sheephead, California	*Semicossyphus pulcher*			X	X
Sole, Dover	*Microstomus pacificus*		X		

Table 4.7-2 Fish Common to the Project Vicinity Based on Habitat and Water Depth

Common Name	Scientific Name	Soft Bottom 0 to 82 feet (0 to 25 m)	Soft Bottom > 82 feet (> 25 m)	Hard Bottom 0 to 82 feet (0 to 25 m)	Hard Bottom > 82 feet (> 25 m)
Sole, petrale	*Eopsetta jordani*		X		
Surfperch spp.	*Embiotocidae*	X			
Thornyhead spp.	*Sebastolobus* spp.		X		X

Source: Leet 2001

Special Status Marine Fish Species

The special status species discussed below have been identified as potentially occurring or potentially having habitat within or near the Project site.

Steelhead *(Oncorhynchus mykiss)* - Federal Endangered

The steelhead is a seagoing rainbow trout that spawns in freshwater streams. The hatchlings migrate to the open ocean, where they mature before returning to fresh water to spawn. Spawning typically occurs from December to May but may occur during fall as well.

The National Oceanic and Atmospheric Administration (NOAA) Fisheries identified 15 Evolutionarily Significant Units (ESU) of *O. mykiss* within its Pacific range. The Southern California Steelhead ESU is listed as endangered under the Endangered Species Act (ESA). The ESU includes all naturally spawned populations of steelhead (and their progeny) in streams from the Santa Maria River to Malibu Creek, California (inclusive).

Bocaccio *(Sebastes paucispinnis)* - Federal Candidate

Boccacio are currently retained as a candidate species under the Federal ESA and are one of many species considered important to California fisheries. They are typically found on rocky bottoms or other structures that provide topographical relief.

Pacific rockfish (*Sebastes* spp.) – Federal Candidate

The abundance of many species of Pacific rockfish has declined dramatically over the past two decades within the Southern California Bight (Caselle et al. 2001). Many of these species are being considered for listing under the State and Federal ESAs.

California grunion *(Leuresthes tenuis)* – Special Status Species

This species is considered “biologically and recreationally significant” by the CDFG (Fluharty 2001). The principal range of the grunion is between Point Conception in Southern California and Punta Abreojos in Baja California, Mexico. However, there are

small populations both north and south of these points. Occasionally grunion may appear in fair numbers as far north as Morro Bay, California, and spawning has been reported as far north as Monterey Bay, California.

It inhabits the nearshore waters to a depth of about 60 feet (18 m) and spawns along sandy beaches (CDFG 2001). Grunion "runs" or spawning occurs in Southern California from March through September with most spawning occurring in April and May (Fluharty 2001). Juvenile grunion school in shallow water a few miles from shore.

Essential Fish Habitat

The Magnuson-Stevens Act and the Sustainable Fisheries Act require councils to include descriptions of Essential Fish Habitat (EFH) in all federal fishery management plans. The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (Pacific Fishery Management Council 2003a). This subsection addresses potential Project impacts to EFH within State waters (shore to 3 nautical miles [NM] [3.5 miles or 5.5 kilometers (km)]) and to the outer limit of the Exclusive Economic Zone (~200 NM [230 miles or 371 km]).

EFH has been identified for 89 species in the Pacific region covered by four fishery management plans (FMPs): the Highly Migratory Species FMP, the Coastal Pelagics FMP, the Pacific Salmon FMP, and the Pacific Groundfish FMP, all under the auspices of the Pacific Fishery Management Council (PFMC). The maintenance of a healthy and viable benthic community is recognized as critical to supporting most, if not all, of the life history requirements previously mentioned. This subsection describes each species managed by the PFMC and the potential for its occurrence within the area.

Highly Migratory Species

EFH for these species are described in the Highly Migratory Species (HMS) FMP (Pacific Fisheries Management Council 2003a). HMS are pelagic or oceanic and travel great distances to feed or reproduce. Their presence depends on ocean temperature, availability of food, and other factors. The HMS managed by the PFMC potentially occurring within or near the proposed Project site are listed below:

- Tunas: albacore (all life stages), bigeye (juvenile and adult), northern bluefin (juvenile and adult), skipjack (adult), yellowfin (juvenile);
- Billfish/swordfish: broadbill swordfish (juvenile and adult);
- Dolphinfish/dorado/mahi mahi (juvenile, subadult, and adult); and
- Sharks: common thresher shark (all life stages), bigeye thresher shark (late juveniles and adults), shortfin mako shark (all life stages), blue shark (all life stages).

Coastal Pelagic Species

Coastal pelagic species (CPS) managed by the PFMC include northern anchovy, market squid, Pacific bonito, Pacific saury, Pacific herring, Pacific sardine, Pacific (chub or blue) mackerel, and jack (Spanish) mackerel. Each of these species typically occurs in nearshore schools. Much of the jack mackerel range lies outside the 174 NM (200 miles or 322 km) U.S. Exclusive Economic Zone, although small jack mackerel are often found near the mainland coast and islands and over shallow rocky banks.

Pacific Groundfish

Groundfish species covered by the PFMC's Groundfish FMP (Pacific Fisheries Management Council 2003b) include 82 species that, with a few exceptions, live on or near the bottom of the ocean. These include:

- Rockfish: the plan covers 64 species;
- Flatfish: the plan covers 12 species;
- Groundfish: the plan covers six species, including lingcod, cabezon, kelp greenling, Pacific cod, Pacific whiting, and sablefish;
- Sharks and skates: the plan covers six species, including the leopard shark, soupfin shark, spiny dogfish, big skate, California skate, and longnose skate; and
- Other species: ratfish, finescale codling, and Pacific rattail grenadier.

Pacific Salmon

The only salmon species found in Southern California is the chinook or king salmon. The EFH for chinook salmon extends from the Canadian border to Point Conception in California (Pacific Fisheries Management Council 2000). There is no designated freshwater chinook salmon EFH in Southern California. Although the southern EFH ends at Point Conception, chinook salmon periodically migrate as far south as Baja California, Mexico. Adult chinook salmon can be found off the Ventura coast from approximately the end of March to the end of September. In some years, when water temperatures are too warm and schooling baitfish are not plentiful, adult chinook salmon will only migrate as far south as central California.

4.7.1.3 Conservation Areas and Research Programs

Cowcod Conservation Area

The proposed Project is just outside of the northern boundary of the California Cowcod Conservation Area. The Cowcod Conservation Area was identified as part of the rebuilding plan developed by the PFMC in accordance with the National Standard Guidelines for the Magnuson-Stevens Act and in response to the cowcod (*Sebastes levis*) assessment conducted by NOAA Fisheries and the CDFG. The PFMC determined that the cowcod resource was over-fished, and as part of a rebuilding strategy developed a rebuilding plan for cowcod and other rockfish and identified crucial

habitat off the San Diego coast of Southern California (Pacific Fisheries Management Council 2003b).

Marine Protected Areas, Channel Islands National Marine Sanctuary

At the closest point, the proposed Project lies within 18 NM (20.7 miles or 33 km) of the Channel Islands National Marine Sanctuary (CINMS). The CINMS encompasses 1,252.5 square NM (1,088 square miles or 2,817 square km) of the waters surrounding the four northern Channel Islands and Santa Barbara Island. It extends from high tide to 6 NM (6.9 miles or 11 km) offshore. Commercial and sport fishing activities are allowed within the sanctuary, subject to CDFG regulations.

Ten marine protected areas (MPAs) have been established within the State waters of the CINMS. No take of marine organisms is allowed within these MPAs. In addition, two marine conservation areas have also been established. Limited recreational and/or commercial fishing is allowed within these areas.

California Oceanic Cooperative Fisheries Investigations (CalCOFI)

The California Oceanic Cooperative Fisheries Investigations (CalCOFI) is a partnership of the CDFG, NOAA Fisheries, and the Scripps Institution of Oceanography. The organization studies the marine environment off the coast of California and the management of its living resources. Currently, two to three week cruises are conducted quarterly on a grid of 66 stations off Southern California. At each station, physical and chemical measurements are made to characterize the environment and map the distribution and abundance of phytoplankton, zooplankton, and fish eggs and larvae. Although some of these stations exist near the proposed Project site, no impact on the CalCOFI research or the 66 research stations is expected.

Hubbs-SeaWorld Research Institute Grace Mariculture Project

The Hubbs-SeaWorld Research Institute (HSWRI), with support from Chevron Texaco Environmental Management Corporation and Venoco, Inc., is seeking approvals to operate a marine aquaculture (mariculture) project for three years at Venoco's Platform Grace, which is located 10.5 NM (12.1 miles or 19.4 km) offshore Ventura County in Federal waters. Platform Grace would provide infrastructure and services for the research proposed, including available deck space, utilities, and daily access by supply boats from Port Hueneme. As proposed, the roughly 640-acre (249 hectare [ha]) project would include four submerged cages around the platform as well as tanks on the main platform deck for hatchery and nursery operations. Species produced would include finfish such as white seabass, striped bass, California halibut, and California yellowtail and bluefin tuna, as well as shellfish such as red abalone and mussels. The project is currently undergoing NEPA processing. If the Grace Mariculture Project is approved as a three-year trial project, as proposed by HSWRI, it would conclude before BHPB would commence installation of the proposed LNG Deepwater Port (DWP) (estimated in 2008); consequently, no impacts are anticipated.

Coastal Wetlands

Ormond Beach has been designated a priority site for preservation and restoration under the Southern California Wetlands Recovery Project of the California Coastal Conservancy. Historically, extensive estuarine wetlands systems once existed on the coast of Oxnard; however, most of this wetland complex has since been destroyed by development. South Ormond Beach is one of the few remaining pieces that are still relatively unmodified. The system is severely degraded and restoration projects propose restoration of tidal water flow to South Ormond Beach (California Coastal Conservancy 2004). A detailed discussion of wetlands near the Project site and any potential impacts and mitigation measures is provided in Section 4.8 "Biological Resources – Terrestrial."

4.7.1.4 Marine Mammals

All marine mammals are protected under the Marine Mammal Protection Act (MMPA). Several species of threatened or endangered marine mammals potentially occur within or near the Project site. (These are discussed below. Non-listed species are discussed first; a separate discussion for threatened and endangered species is at the end of the marine mammal subsection.)

Habitats

Marine mammals are wide-ranging, occupying numerous habitats with distinct bathymetric features, many of which are not present at or near the Project site. Escarpments, characterized by upwelling and vigorous food production, are particularly attractive to many marine mammal species. The greatest abundance and diversity of marine mammals in the region occur around the escarpments surrounding the Channel Islands. Thus, although marine mammal species are abundant and diverse in the general region, they are much less prolific at the Project site itself, which includes the pipeline route and FSRU.

Taxa

Marine mammals discussed in this draft Environmental Impact Statement/ Environmental Impact Report (EIS/EIR) represent the order *Cetacea*, which includes 34 species of whales, dolphins, and porpoises; the order *Pinnipedia*, which includes six species of seals and sea lions; and the family *Mustelidae*, which includes only the southern sea otter *(Enhydra lutris nereis*). Six species of cetaceans are federally listed as endangered, while two species of pinnipeds and the southern sea otter are considered threatened.

*Cetacean*s

The occurrence of non-listed species of cetaceans in the region and near the Project site is summarized on Table 4.7-3. Brief species accounts are provided below.

Mysticetes

The suborder *Mysticeti*, comprising the baleen whales, is represented by eight species, five of which are federally listed as endangered. The remaining three species include Bryde's whale (*Balaenoptera edeni*), the minke whale (*B. acutorostrata*), and the California gray whale (*Eschrichtius robustus*), which was delisted in 1993 after its population recovered (Rugh et al. 1999).

Bryde's whale is a subtropical-to-tropical species that has been reported only twice in the Southern California Bight (Barlow 1995; Forney et al. 1995; Barlow and Gerrodette 1996; Howorth 1962-2004). The California-Oregon-Washington stock size is estimated at 12 individuals (Carretta et al. 2002). Considering these factors, the chances of it appearing at or near the Project site are extremely remote.

The California-Oregon-Washington stock of minke whales is estimated at 631 individuals (Carretta et al. 2002). Minke whales are most abundant in spring and summer in the Southern California Bight (Dohl et al. 1981), perhaps entering the region from the south and offshore. Most sightings are of individual animals, although two to five whales are sometimes reported in small areas. Sightings of this species are infrequent and appear to have diminished over the years. Minke whales could be encountered at or near the Project site, but never in numbers and only uncommonly.

California gray whales migrate annually from their winter breeding and calving grounds in the lagoons of Baja California, Mexico, to their summer feeding grounds in Alaska. The southbound migration generally begins in December and ends in mid-February, with some southbound individuals appearing as early as October or as late as April. The northbound migration begins in mid-February and ends in May, with rare stragglers in the summer months. Although comparatively more individuals hug the coast on the route north, the majority of animals during both migrations favor the Channel Islands rather than the mainland coast along the Southern California Bight (Carretta et al. 2000; Howorth 1998a).

Several migration corridors exist near the Project site and are depicted in Figure 4.7-1. To the south, one corridor leads from Santa Catalina Island along an escarpment southwest of the Santa Monica Basin to Anacapa and the Santa Cruz islands. This corridor passes offshore of the FSRU site. Other corridors exist even farther offshore, but they are too distant to be of concern for this Project. One inshore track hugs the coast the entire way, with individuals remaining just outside the surf to up to 1 NM (1.15 miles or 1.9 km) offshore. At least one other track appears to follow the bathymetric contours just inshore of the Northbound Coastwise Traffic Lane. This track appears to diverge as it enters the Anacapa Passage, northwest of the Project site.

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Table 4.7-3 Occurrence of Protected Species of Cetaceans in or near the Project Site

Species	Population or Stock Size	Occurrence in Southern California Bight	Reported near Project Site	Potential Occurrence
Short-beaked common dolphin*	373,573	Abundant	Yes	Likely
Long-beaked common dolphin*	32,239	Abundant	Yes	Likely
Bottlenose dolphin: coastal stock	206	Common; low numbers	Yes	Likely within 1 km of shore; small numbers and sporadic
Bottlenose dolphin offshore stock	956	Locally abundant	No	Unlikely
Pacific white-sided dolphin	25,825	Sporadically abundant; cold water	Yes	Unlikely
Northern right whale dolphin	13,705	Sporadically abundant; cold water	No	Unlikely
Risso's dolphin	16,483	Locally abundant	Yes	Possible
Killer whale (both stocks)	346 (transient); 285 (offshore)	Uncommon	Yes	Unlikely
Short-finned pilot whale	970	Uncommon	No	Extremely remote
False killer whale	Not available for Southern California Bight	Rare	No	Extremely remote
Spotted dolphin	Not available for Southern California Bight	Rare	No	Extremely remote
Striped dolphin	Not available for Southern California Bight	Rare	No	Extremely remote
Long-snouted spinner dolphin	Not available for Southern California Bight	Rare	No	Extremely remote
Rough-toothed dolphin	Not available for Southern California Bight	Rare	No	Extremely remote
Dall's porpoise	117,545	Sporadically abundant; cold water	Yes	Possible
Harbor porpoise	932	Rare	No	Remote
Baird's beaked whale	379	Rare	No	Extremely remote

Table 4.7-3 Occurrence of Protected Species of Cetaceans in or near the Project Site

Species	Population or Stock Size	Occurrence in Southern California Bight	Reported near Project Site	Potential Occurrence
Cuvier's beaked whale	5,870	Uncommon	No	Extremely remote
Hubb's beaked whale	3,738 combined with others	Rare	No	Extremely remote
Blainville's beaked whale	360	Rare	No	Extremely remote
Gingko-toothed whale	3,738 combined with others	Rare	No	Extremely remote
Perrin's beaked whale**	3,738 combined with others	Rare	No	Extremely remote
Stejneger's beaked whale	3,738 combined with others	Rare	No	Extremely remote
Pygmy sperm whale	4,746	Rare	No	Extremely remote
Dwarf sperm whale	Not available	Rare	No	Extremely remote
California gray whale	17,414	Common seasonally	Yes	Likely December through May
Minke whale	631	Uncommon	Yes	Unlikely; very low numbers
Bryde's whale	12	Extremely rare	No	Extremely remote

* The short- and long-beaked common dolphins were once considered a single species; thus, earlier surveys may have reported only *Delphinus delphis* near the site.

** Formerly reported as Hector's beaked whale (*Mesoplodon hectori*)

Sources: Carretta et al. 2001 and 2002; Rugh 2002.

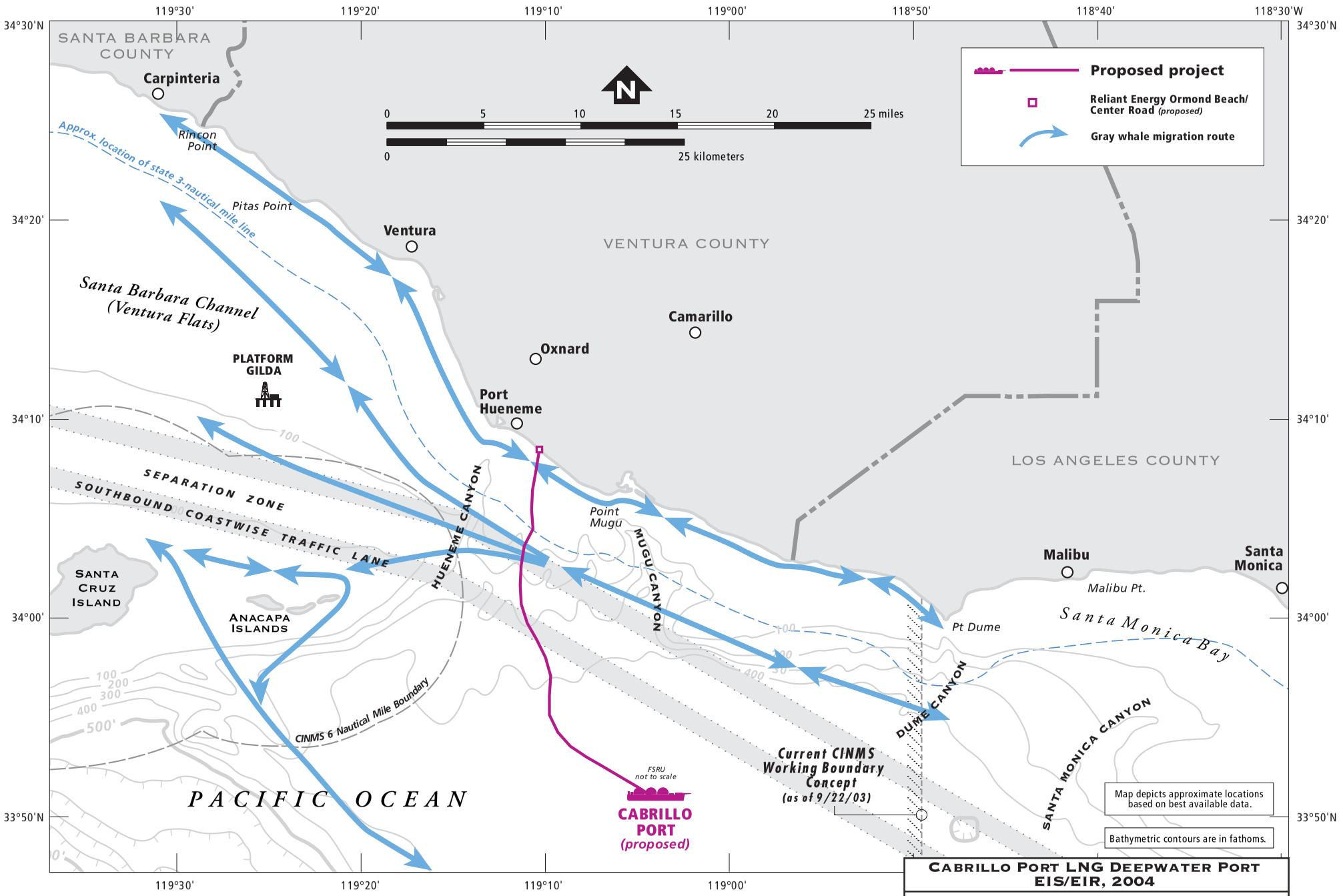
The main track continues just inshore from the Northbound Coastwise Traffic Lane and immediately seaward of Platforms Gail and Grace. This track branches, however, with one fork stretching across the broad alluvium of what is colloquially known as the Ventura Flats. This track ranges from 60 to 150 feet (18 to 46 m) in depth, converging within 2 to 3 NM (2.3 to 3.5 miles, or 3.7 to 5.5 km) offshore off Coal Oil Point, northwest of Santa Barbara. Another branch may extend along the north shore of the northern Channel Islands, joining one of the branches of the track offshore of the FSRU site.

Gray whales may be encountered periodically at or near the Project site, at least from December through May.

Odontocetes

Odontocetes, comprising toothed whales, dolphins, and porpoises, are represented by 26 species, only one of which is federally listed as endangered. Of these, 14 are

References: Howorth, 2004 and Carretta et al, 2000



CABRILLO PORT LNG DEEPWATER PORT EIS/EIR, 2004

Figure 4.7-1

Gray Whale Migration Routes

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oceanic dolphins (see Table 4.7-3). Five of these species are tropical and subtropical in distribution and have only rarely been reported in the Southern California Bight. Thus, the chances of their appearing at or near the Project site are extremely remote. Of the remaining species, the killer whale (*Orcinus orca*) appears sporadically in the Southern California Bight. Although its presence is unlikely, it could occur during the northbound migration of gray whales.

The Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), associated with cooler waters, sometimes appears in late spring and summer, often with humpback whales (*Megaptera novaeangliae*), which generally appear along the escarpment north of the northern Channel Islands. The northern right whale dolphin (*Lissodelphis borealis*) could appear in spring and early summer. The short-finned pilot whale, (*Globicephala macrorhynchus*) was once common off Santa Catalina and Santa Barbara islands and was reported infrequently in the Santa Barbara Channel. Since the 1982-1983 El Niño event, however, this species has virtually disappeared and only recently has been reported, although not in its previous abundance.

The Risso's dolphin (*Grampus griseus*) is commonly seen, particularly along the escarpment north of the four northern Channel Islands. It is possible that the Risso's dolphin would be encountered offshore. Two species of common dolphin, the long-beaked (*Delphinus capensis*) and the short-beaked (*Delphinus delphis*) are abundant in the region and very likely would be encountered offshore at the Project site. Although both species favor escarpments and also prey on squid, they mainly prey on small schooling fish such as northern anchovies, which are common off the mainland coast. Two stocks of bottlenose dolphins (*Tursiops truncatus*) exist in the Southern California Bight. The coastal stock comprises only approximately 206 individuals, while the offshore stock includes approximately 956 (Carretta et al. 2002). The offshore stock is often seen in the San Pedro Channel and off Santa Catalina and Santa Barbara islands and, to a much lesser extent, in the Santa Barbara Channel. The presence of this stock near the FSRU site is unlikely. The coastal stock ranges from northern Baja California to central California but is often concentrated from Ventura through San Luis Obispo Counties. This stock occurs from the surf zone to approximately 0.6 NM (0.7 mile or 1 km) offshore. It may be sporadically present along the nearshore sections of the pipeline route.

Porpoises include Dall's porpoise (*Phocoenoides dalli*) and the harbor porpoise (*Phocoena phocoena*). Dall's porpoise is a cold-water species that most often appears in spring and early summer. Its presence in the offshore waters of the Project site is possible in season. The harbor porpoise, a coastal species, is uncommon south of Point Conception. The odds of its occurrence within the Project site are remote.

Other odontocetes occurring in the region include two sperm whales: the dwarf sperm whale (*Kogia simus*) and the pygmy sperm whale (*Kogia breviceps*). These are both cryptic species that remain submerged for extended periods. Although they favor basins and trenches, they have not been reported near the Project site except for rare stranded specimens, nor have they been reported over the Hueneme Canyon.

Seven species of beaked whales have been reported in the region. Baird's beaked whale (*Berardius bairdii*) is associated with continental slope and deep ocean waters and has not been reported near the Project site. Its presence is extremely unlikely. The other six beaked whales (noted in Table 4.7-3), like the sperm whales mentioned above, are cryptic in behavior and remain submerged for extended periods.

Pinnipeds

Six species of pinnipeds have been reported in the Southern California Bight (see Table 4.7-4). Of these, two species are federally listed as threatened. In addition, the ribbon seal (*Histriophoca fasciata*), an Alaskan species, was reported once in the Southern California Bight (Woodhouse, pers. comm. 1995).

Table 4.7-4 Occurrence of Pinnipeds in or near the Project Site

Species	Status	Stock size	Occurrence in Southern California Bight	Reported near Project Site	Potential Occurrence
California sea lion	Protected	204,000-214,000	Common	Yes	Very likely
Northern fur seal	Protected	4,336	Uncommon	No	Extremely remote
Pacific harbor seal	Protected	30,293	Common	Yes	Very likely
Northern elephant seal	Protected	101,000	Common	No	Unlikely
Ribbon seal	Protected	Not available for area	Extremely rare	No	Extremely remote
Sources: Carretta et al. 2001 and 2002; Angliss et al. 2001; NOAA 2000a; Woodhouse 1995					

The California sea lion (*Zalophus californianus c.*) is the most common pinniped in the Southern California Bight, both in numbers and in distribution. Several rookeries exist on the Channel Islands. California sea lions are present year-round in the Southern California Bight, although females may range into central California and males as far north as British Columbia from fall through spring. California sea lions are common throughout the waters of the bight and are known to be present at the Project site. Northern fur seals (*Callorhinus ursinus*) have two rookeries on San Miguel Island. They are pelagic animals, occurring as far north as the Bering Sea. The chances of these seals occurring at the Project site are extremely remote.

The northern elephant seal (*Mirounga angustirostris*) has become abundant over the past few decades. It ranges from Baja California to the Gulf of Alaska, with rookeries on several islands off Baja California, the Channel Islands, along the central California coast, and at the Farallon Islands off San Francisco. It generally forages in deep waters throughout its range, although most of those in the Channel Islands appear to travel north, with males going as far as the Gulf of Alaska. The chances of this species occurring at the Project site are unlikely.

The Pacific harbor seal (*Phoca vitulina richardsi*) is common year-round throughout the Southern California Bight. Rookeries exist throughout the Channel Islands and along the mainland coast. Harbor seals generally do not travel far from their rookery and haul-out sites; journeys of a few hundred miles are unusual. The nearest harbor seal rookeries to the Project site are on Anacapa Island and at Mugu Lagoon, at the Naval Air Warfare Center Point Mugu. Mugu Lagoon is less than 5 NM (5.8 miles or 9 km) southeast of the pipeline shore crossing.

Special Status Species

The species listed below in Table 4.7-5 are endangered or threatened under both the Federal and State ESAs. No candidates for listing are proposed at this time. No critical habitat has been declared in the Southern California Bight for any of the listed species and so the Project would not have any impact on critical habitat.

Table 4.7-5 Occurrence of Threatened or Endangered Species Potentially Occurring in or near the Project Site

Species	Status	Stock size	Occurrence in Southern California Bight	Reported near Project Site	Potential Occurrence
Sei whale	Endangered	Not available	Extremely rare	No	Extremely remote
Blue whale	Endangered	1,940	Seasonally abundant along escarpments	No	Very unlikely
Fin whale	Endangered	1,851	Uncommon	Yes	Unlikely
Humpback whale	Endangered	856	Seasonally abundant along escarpments	No	Very unlikely
North Pacific right whale	Endangered	Not available	Extremely rare	No	Extremely remote
Sperm whale	Endangered	1,407	Rare	No	Extremely remote
Steller sea lion	Threatened	31,005	Extremely rare	No	Extremely remote
Guadalupe fur seal	Threatened	7,408	Rare	No	Extremely remote
Southern sea otter	Threatened	2,825	Rare	No	Remote
Sources: Carretta et al. 2001 and 2002; Angliss et al. 2001.					

The species discussed below are considered strategic under the MMPA. The same stocks are also considered depleted (populations fall below optimum sustainable levels) under the MMPA.

Sei Whale (*Balaenoptera borealis*) – Federal Endangered

Sei whales in the eastern North Pacific, east of 180 degrees west longitude, are considered a separate stock for management purposes. The stock size is not known, nor is the population trend. Sei whale observations have been rare in the Southern California Bight for more than 20 years. The chances of any sei whales appearing at the Project site are extremely remote.

Blue Whale (*B. musculus*) – Federal Endangered

The eastern North Pacific stock of blue whales is robust at present. Sightings have become much more frequent recently, but it is not known whether this represents a change in distribution or a definite increase in stock size. The most recent stock estimate is 1,940 (Carretta et al. 2002). Blue whales usually appear off California in June and remain until early to late fall. Although occasional individuals have been reported year-round, most blue whales winter off Mexico and Central America (Larkman and Veit 1998).

Off California, blue whales favor escarpments, where upwelling and consequent food production are vigorous. They frequent the Santa Rosa Cortez Ridge, northwest of San Nicolas Island, and often follow the escarpment leading northwest to San Miguel Island. They generally continue along this escarpment, which circles the west end of San Miguel Island and doubles back along the north shores of the four northern Channel Islands. Blue whales also cross the west end of the Santa Barbara Channel, following various coastal escarpments all the way to the Gulf of the Farallones and beyond. Very few blue whales have been reported near the mainland coast of the Southern California Bight, and the presence of this species at the Project site is very unlikely.

Fin Whale (*B. physalus*) – Federal Endangered

The California-Oregon-Washington stock of fin whales may have increased slightly over the past two decades. The present estimated stock size is 1,851 (Carretta et al. 2002). Fin whales frequent the continental slope and coastal basins. They have been seen occasionally with blue and humpback whales along the escarpment north of the four northern Channel Islands (see previous and following species accounts).

Fin whales are most frequently seen during the warmer-water months of summer and fall. They have been frequently sighted west and northwest of San Nicolas Island in fall. Fin whales also have been reported occasionally around Santa Barbara Island and northwest of the island in late summer and early fall. Although one fin whale was observed in late winter near the middle of the proposed pipeline route during the 1991-1992 National Marine Fisheries Service (NMFS) aerial surveys, the vast majority of sightings have been well to the southwest of this location. Although the presence of this species near the FSRU is possible, it is unlikely. The chances of fin whales appearing near the mainland coast are extremely remote.

Humpback Whale (*Megaptera novaeangliae*) – Federal Endangered

The eastern North Pacific stock of humpback whales has been estimated at 856 and may be increasing (Carretta et al. 2002). This stock ranges from Central America and Mexico, where it winters, to Washington State. Humpbacks, like blues, frequent escarpments where upwelling is vigorous. They have been reported southwest of San Clemente Island during summer and fall and off San Nicolas Island. Like blue whales, they appear to follow the Santa Rosa Cortez Ridge to the south side of San Miguel Island, entering the Santa Barbara Channel as they round the island.

Humpbacks generally appear in the channel in mid- to late May, a few weeks earlier than the blue whales. From the Santa Barbara Channel, they also range north to the Gulf of the Farallones and beyond. Unlike blue whales, however, humpbacks range closer to the mainland coast and have been reported around many oil platforms in the Santa Barbara Channel. Humpbacks have not been reported near the mainland coast south of Point Dume, and the chances of this species appearing at or near the Project site are very unlikely.

North Pacific Right Whale (*Eubalaena japonica*) – Federal Endangered

The North Pacific right whale was recently reclassified as a separate species based on genetic data (Rosenbaum et al. 2000). The North Pacific right whale is the most gravely endangered of all marine mammals in the region, if not in the world. No estimates of its stock size are available, but only 100 to 200 animals were thought to survive (Wada 1973; Braham and Rice 1984). Just one calf has been reported in the eastern North Pacific since 1900. Only 23 individuals were sighted during the period 1855 to 1982 (Scarff 1986). Since that time, two sightings have been reported in the Santa Barbara Channel. The most recent southernmost sighting was made in 1998 off Cabo San Lucas, Baja California Sur, Mexico (Gendron et al. 1999).

Historically, the range of this species extended from 35 degrees north latitude, or near Avila Beach and Morro Bay, California, to the Arctic, with occasional animals reported as far south as central Mexico, or about 20 degrees north latitude. Considering the extreme rarity of this species, the likelihood of it appearing at or near the Project site is extremely remote.

Sperm Whale (*Physeter macrocephalus*) – Federal Endangered

The sperm whale is the only listed odontocete. The California-Oregon-Washington stock size is estimated at 1,407 (Carretta et al. 2002). Population trends are unknown. Sperm whales have been reported year-round off California, with peak numbers appearing from April through mid-June and from the end of August into mid-November (Rice 1974). Off California, sperm whales frequent deep offshore waters, although in the Gulf of California they sometimes venture into shallow water after the various species of squid that form a staple of their diet. Single sperm whales have been reported on three occasions in the Santa Barbara Channel. Considering this species'

preference for deep offshore water, the chances of it appearing at or near the Project site are extremely remote.

Steller Sea Lion (*Eumetopias jubatus*) – Federal Threatened

The eastern stock of Steller sea lions ranges from east of Cape Suckling, Alaska, or about 144 degrees west longitude, to the Southern California Bight. The eastern stock is currently estimated at 31,005. The California stock of "non-pups" declined to 1,500 between 1980 and 1998 from a stock of 5,000 to 7,000 during the period 1927 to 1947 (Angliss et al. 2001). Historically, Steller sea lions occurred at San Nicolas Island. Steller sea lions once inhabited San Miguel Island but disappeared after the 1982-1983 El Niño event. Only two sightings, both of individual animals, have been made in the bight since that time (Melin, pers. comm. 2004; Howorth 1962-2004). Thus, the odds of this species appearing at the Project site are extremely remote.

Guadalupe fur seal (*Arctocephalus townsendi*) – Federal Threatened

The Guadalupe fur seal population is concentrated at Guadalupe Island, off central Baja California on the Pacific side. A few pups have been reported at Isla de Benito del Esta, also off Baja California, while a few adults have been reported in the Gulf of California (Gamboa et al. 1999). The last estimate of the Mexican stock size was 7,408, made in 1993 (Maravilla-Chavez and Lowry 1997). No stock size estimate is available for American waters.

Historically, Guadalupe fur seals were once prolific at the Channel Islands. A few individuals have been reported there over the past century, and during the winter of 1997-1998 a pup was successfully weaned at San Miguel Island (Melin and DeLong 1999). Strandings of this species are rare, with perhaps a dozen specimens reported in the Southern California Bight over the past three decades. Considering the rarity of this species in U.S. waters, the chances of it appearing at the Project site are extremely remote.

Southern Sea Otter (*Enhydra lutris nereis*) – Federal Threatened

The California population of the southern sea otter has been generally increasing since a remnant colony was discovered off Bixby Creek, off central California, in 1937. Fluctuations in the stock over the past decade have been a cause for concern, although the 2003 count (2,825) was the highest made over the past 20 years, since modern census methods were initiated (U.S. Geological Survey 2004).

The present range of sea otters extends from Point Conception to Año Nuevo Island, in Santa Cruz County, California. During the spring over the past few years, some sea otters, primarily young males, have ventured south of Point Conception into the rich kelp beds between Gaviota and the point. Sightings farther south along the mainland coast have been rare. The southernmost sighting of a sea otter was made at Isla Magdalena, Baja California (Rodriguez-Jaramillo and Gendron 1996). Occasional sightings have been made at the Channel Islands, particularly San Miguel.

From 1987 to 1990, 139 sea otters were relocated from central California to San Nicolas Island. The relocation is generally not considered to have been a successful effort. Although some otters remain there, whether some are relocated animals, their offspring or other animals that have moved in, or a combination, is not known. Sea otters generally forage in water depths up to 65 feet (20 m), although some have been reported in water up to 130 feet (40 m) deep. Considering the narrow depth range of this species and its scarcity south of Point Conception, the chances of any being seen even in the nearshore waters of the Project site are remote.

4.7.1.5 Seabirds

Habitats

Like marine mammals and sea turtles (see Subsection 4.7.1.4, "Marine Mammals," and Subsection 4.7.1.6, "Sea Turtles"), seabirds are wide-ranging and occupy a variety of habitats. The majority of species migrate seasonally through the region, while others are resident year-round. Many species use nearshore and/or offshore waters as foraging grounds for fish and invertebrate prey. Some also use the nearby Channel Islands as roosting sites and sometimes as rookeries. Summaries of the use of various habitats by various species are provided in the species accounts (below). A number of species, including shorebirds and various marsh birds, forage and nest in mainland estuaries or along the shores; these are discussed in Subsection 4.7, "Biological Resources—Terrestrial."

Taxa

In the adjacent Channel Islands, Santa Barbara Channel, and off the mainland coast, some 195 species of seabirds have been recorded (Baird 1993). Considering their speed and mobility, it is likely that virtually all of these species may occur at or near the Project site.

Common Species

Considering the abundance and diversity of seabirds in the Southern California Bight, common marine birds are summarized by families and subfamilies instead of species. Families and subfamilies represented by common local species are listed below. Emphasis has been placed on seabirds that land on or dive into the ocean because such species are more vulnerable to potential offshore Project-related impacts such as LNG, oil, or fuel spills.

- Family Gaviidae: loons
- Family Podocipedidae: grebes
- Family Procellariidae: shearwaters, petrels, and the northern fulmar (*Fulmaris glacialis*)
- Family Phalacrocoridae: cormorants
- Subfamily Aythyinae: diving ducks and the surf scoter (*Melanitta perspicillata*)

- Family Laridae: gulls and terns
- Family Hydrobatidae: storm petrels
- Family Phalaropidae: phalaropes
- Family Alcidae: auklets, puffins, murres, murrelets, and the pigeon guillemot (*Cepphus columba*)
- Family Stercorariidae: jaegers and skuas

Special Status Species

Most seabirds are protected under the Federal Migratory Bird Treaty Act. In addition, some are listed as California Species of Special Concern:

- Double-crested cormorant (*Phalocrocorax auritus*);
- Elegant tern (*Sterna elegans*);
- Long-billed curlew (*Numenius americanus*);
- California gull (*Larus californicus*);
- Common loon (*Gavia immer*);
- Ashy storm petrel (*Oceanodroma melania*); and
- Rhinoceros auklet *(Cerohinca monocerata*).

Several species of shorebirds and seabirds are listed as threatened or endangered. The California least tern (*Sterna albifrons browni*), the western snowy plover (*Charadrius alexandrinus nivosus*), and the light-footed clapper rail (*Rallus longirostris levipes*) – all threatened or endangered species – are discussed in greater detail in Subsection 4.7, "Biological Resources—Terrestrial." Threatened and endangered species of seabirds found offshore are discussed below.

<u>California Brown Pelican (*Pelecanus occidentalis californicus*) – State and Federal Endangered</u>

The California brown pelican ranges from northwestern Mexico to British Columbia. The main breeding colonies are in the Gulf of California and on the Tres Marias Islands off mainland Mexico. Colonies have ranged as far north as Point Lobos, in Monterey, California. In the Southern California Bight, California brown pelicans only nest on Anacapa and Santa Barbara islands, although they once nested on other islands. At the Channel Islands, breeding generally takes place from March through early August (MMS 2001). Fledging takes place in about 13 weeks (U.S. Fish and Wildlife Service 1983; Cogswell 1977). As early as May, large numbers of pelicans arrive from Mexico. By July, most are north of Point Conception. Some will travel as far north as British Columbia by late summer or early fall. From December through March, all but about 500 pairs leave the northern area, many returning to Mexico (Minerals Management Service 2001). Critical habitat has not been established for this species. California

brown pelicans are abundant in the bight year-round and will be seen throughout the region and within and near the Project site.

Marbled Murrelet (*Brachyramphus marmoratus marmoratus*) – State Endangered; Federal Threatened

Marbled murrelets range from California to Alaska. Their breeding range extends as far south as central California. In California, critical habitat consists of old-growth forest, where they nest, from Santa Cruz County north. Marbled murrelets prey on small fish in nearshore waters, generally staying within 0.6 to 1.2 NM (0.7 to 1.4 miles, or 1.1 to 2.2 km) of shore. During winter, small numbers of marbled murrelets could possibly be encountered in the nearshore waters of the Project site.

Xantus' Murrelet (*Synthliboramphus hypoleucus*) – State Threatened; Federal Candidate

Xantus' murrelets nest in April and May on Santa Barbara Island and on several islands off the northwestern coast of Baja California. By early summer, the chicks have fledged and joined their parents at sea. Xantus' murrelets range from Baja California to at least Oregon (Thoresen 1992). This species will be encountered at the Project site.

4.7.1.6 Sea Turtles

Habitats

The green sea turtle (*Chelonia mydas*), the loggerhead sea turtle (*Caretta caretta*), and the olive ridley sea turtle (*Lepidochelys olivacea*) frequent tropical to temperate waters and generally appear as transients in the Southern California Bight, usually during the warm water months of summer and early fall or during El Niño events. A few cheloniids have been reported stranded as far north as Alaska during El Niño events. Nonetheless, the bight lies beyond the normal habitat for these species. A notable exception is an anomalous population of 50 to 60 green sea turtles in San Diego Bay (Dutton and McDonald 1990a, 1990b, 1992). These animals frequent the warm water discharge of the San Diego Gas and Electric Company (SDG&E) Power Plant. The leatherback sea turtle (*Dermochelys coriacea*) ranges from Chile to Alaska; thus, the Southern California Bight is considered within its normal range and foraging habitat.

Taxa

Four species of sea turtles have been reported in the northeastern Pacific. Three are members of the family *Cheloniidae*, while the fourth is the only living representative of the family *Dermochelyidae* (NMFS and United States Fish and Wildlife Service [USFWS] 1998d). (See Table 4.7-6).

Special Status Species

All species reported in the Southern California Bight and listed in Table 4.7-6 are considered endangered or threatened under both the Federal and State ESAs (no

unlisted species or candidate species of sea turtles are present). No critical habitat has been established for these species. No stock sizes are available and all stocks continue to decline (NOAA Fisheries and U.S. Fish and Wildlife Service 1998a, b,c,d). Sea turtles have not been reported at or near the Project site despite a comprehensive study by Stinson (1984) and numerous marine mammal surveys conducted between 1975 and 1993 (Bonnell et al. 1981; Dohl et al. 1981; Hill and Barlow 1992; Carretta and Forney 1993; Mangels and Gerrodette 1994; Carretta et al. 2000 and 2001; Barlow and Taylor 2001).

Table 4.7-6 Occurrence of Threatened and Endangered Species of Sea Turtles in or near the Project Site

Species	Status	Stock size	Occurrence in Southern California Bight	Reported near Project Site	Potential Occurrence
Loggerhead sea turtle	Threatened	Not available	Rare	No	Extremely remote
Green sea turtle	Threatened	Not available	Rare	No	Extremely remote
Olive Ridley sea turtle	Threatened	Not available	Rare	No	Extremely remote
Leatherback sea turtle	Endangered	Not available	Uncommon but offshore	No	Extremely remote
Sources: NMFS and USFWS 1998a-d; NOAA 2000b.					

Green Sea Turtle (*Chelonia mydas*) – Federal Threatened

Although the eastern North Pacific green sea turtle population is considered threatened, the Mexican nesting population is listed as endangered. The normal range of the green sea turtle is from Baja California to Peru and out to the Galapagos Islands. This species occasionally appears in the Southern California Bight during the warmest-water months of July through October. North of Point Conception, this species occurs mainly during El Niño events. Juveniles have been reported offshore in the Southern California Bight (NOAA Fisheries and U.S. Fish and Wildlife Service 1998a), while adults have been observed along the coast in water up to 165 feet (50 m) deep (Stinson 1984). None have been reported at or near the Project site, so the odds of this species occurring there are extremely remote.

Loggerhead Sea Turtle (*Caretta caretta*) – Federal Threatened

Loggerheads favor tropical to temperate waters. Loggerheads are often reported off Baja California, particularly at Bahia Magdalena. They are rare off California, although individuals have been reported as far north as Alaska. They most often are seen from July through September, particularly during El Niño events. Juvenile loggerheads have been reported occasionally in deep water off the Southern California Bight. This may represent the northern extremity of the range of a much larger population of juveniles found off Baja California (Pitman 1990). The chances of any loggerheads appearing at the Project site are extremely remote.

Olive Ridley Sea Turtle (*Lepidochelys olivacea*) – Federal Threatened

Like the green sea turtle, the Mexican nesting population of the olive ridley sea turtle is considered endangered. The olive ridley sea turtle ranges from tropical to temperate waters, usually from Baja California to Peru in waters up to 1,200 NM (1,394 miles or 2,224 km) offshore (NOAA Fisheries and U.S. Fish and Wildlife Service 1998b). Juveniles have been reported offshore, while adults and sub-adults were most often reported very near the coast, in water up to 165 feet (50 m) deep. Stinson (1984) considered this species rare in the Southern California Bight, and no olive ridleys were seen during extensive marine mammal surveys conducted between 1975 and 1993 (Bonnell et al. 1981; Dohl et al. 1981; Hill and Barlow 1992; Carretta and Forney 1993; Mangels and Gerrodette 1994; Carretta et al. 2000 and 2001; Barlow and Taylor 2001). The odds of any olive ridley sea turtles appearing at or near the Project site are extremely remote.

Leatherback Sea Turtle (*Dermochelys coriacea*) – Federal Endangered

In the eastern Pacific, leatherback sea turtles range along the continental slope from Chile to Alaska in waters 550 to 4,200 feet (168 to 1,280 m) deep. Leatherbacks are the most frequently seen off California, usually appearing from July through September. The frequency of sightings may at least be partly attributable to the sheer size of this species; leatherbacks attain overall lengths of up to 7 feet (2 m), making them more conspicuous than the smaller cheloniids. Nonetheless, leatherbacks were sighted on only four occasions during the extensive marine mammal survey conducted between 1975 and 1993 (Bonnell et al. 1981; Dohl et al. 1981; Hill and Barlow 1992; Carretta and Forney 1993; Mangels and Gerrodette 1994; Carretta et al. 2000 and 2001; Barlow and Taylor 2001). Considering the scarcity of sightings and this species' preference for the continental slope, the chances of any leatherback sea turtles appearing at or near the Project site are extremely remote.

4.7.2 Regulatory Setting

Major Federal and State laws and regulations pertaining to marine resources are summarized in Table 4.7-7.

Coastal Consistency

The Project will require submittal of a consistency certification pursuant to Section 307 (c)(3)(A) of the Coastal Zone Management Act. The California Coastal Commission (CCC) is the agency in the State of California that makes the consistency certification for the State of California.

The Project would require a Federal coastal consistency certification because it would require a Federal permit from the United States Environmental Protection Agency (USEPA) and the United States Army Corps of Engineers (USACE). The consistency certification for the part of the Project that is within State waters is redundant with the coastal development permit.

Articles 2 through 7 of the California Coastal Act address the requirements of a coastal consistency certification. Article 4 relates to Marine Biology.

Article 4 – Marine Environment

This article is intended to protect marine resources and states that marine resources shall be maintained, enhanced, and, where feasible, restored.

Some marine resources would be affected adversely by the construction and operation of this Project; however, most of the effects could be mitigated. Benthic invertebrates could be crushed, buried, or smothered during installation of the subsea pipelines; however, impacts would be restricted to the construction right-of-way (ROW) (approximately 10 acres [4.0 ha]). These communities would be anticipated to re-colonize within 12 months. During construction, marine fishes may avoid the area where construction is occurring; however, this impact would be temporary and fish would be expected to return to the area immediately after construction activities cease. Fish would not be adversely affected during operations. The presence of the pipeline would provide new low-relief habitat that would act as substrate for algae and benthic invertebrates. Sea turtles have a low potential of collision with construction and operational vessels but could become entangled with construction equipment and anchor lines. However, sea turtle density is low and there are no nesting grounds in the Project area. Potential impacts on marine mammals would include entanglement with mooring and anchor lines and construction equipment, vessel collisions, deviation from established migration routes, area avoidance, and hearing loss from noise levels above thresholds. During construction, USFWS-approved marine mammal monitors would be used on the pipe-laying vessel to identify any marine mammals in the construction area and avoid entanglement or collisions with marine mammals. Dampers would be used on construction vessels to lessen the noise generated, thus minimizing adverse noise effects on marine mammals. During operations, the only activities that would occur in State waters would be maintenance of the subsea pipelines and vessel traffic between Port Hueneme and the FSRU. On-going Project-related activities would not contribute to a substantial increase to the existing impacts on marine biota. The Project would be consistent with Article 4.

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Table 4.7-7 Major Laws, Regulatory Requirements, and Plans for Biological Resources - Marine

Law/Regulation/Plan/ Agency	Key Elements and Thresholds; Applicable Permits
Federal	
Outer Continental Shelf Lands Act *- Minerals Management Service (MMS)*	• The statute defines the Outer Continental Shelf (OCS) as all submerged lands lying seaward of State coastal waters (2.6 NM [3 miles or 4.8 km] offshore) which are under U.S. jurisdiction. • The statute authorizes the Secretary of Interior to promulgate regulations to lease the OCS in an effort to prevent waste and conserve natural resources and to grant leases to the highest responsible qualified bidder as determined by competitive bidding procedures.
Marine Mammal Protection Act of 1972 and Amendments *- NOAA*	• The 1972 Marine Mammal Protection Act established a Federal responsibility to conserve marine mammals with management vested in the Department of Interior for sea otter, walrus, polar bear, dugong, and manatee. The Department of Commerce is responsible for cetaceans and pinnipeds other than the walrus.
Marine Protection, Research and Sanctuary Act of 1972 *- USEPA*	• Authorizes the USEPA to regulate ocean dumping of industrial wastes, sewage sludge, and other wastes through a permit program. • The basic objective of the permit program is to "prevent or strictly limit the dumping into ocean waters of any material that would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities." • The Secretary of the Army is authorized to issue permits for dredged material disposal, and the USEPA is authorized to designate appropriate dump sites.
Endangered Species Act of 1973 *- USFWS*	• Provides for the conservation of endangered and threatened species of fish, wildlife, and plants.
Magnuson-Stevens Fishery Conservation and Management Act of 1976 *- NOAA*	• In the exclusive economic zone (EEZ), except as provided in Section 102, the United States claims, and will exercise, sovereign rights and exclusive fishery management authority over all fish and all Continental Shelf fishery resources. • Beyond the EEZ, the United States claims and will exercise exclusive fishery management authority over the all anadromous species throughout the migratory range of each such species, all Continental Shelf fishery resources, and all fishery resources in special areas.
Coastal Zone Management Act *- NOAA*	• The policy preserves, protects, restores, or enhances the resources of the nation's coastal zone for this and succeeding generations to encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone, giving full consideration to ecological, cultural, historic, and aesthetic values as well as the need for compatible economic development.

Table 4.7-7 Major Laws, Regulatory Requirements, and Plans for Biological Resources - Marine

Law/Regulation/Plan/ Agency	Key Elements and Thresholds; Applicable Permits
Marine Plastic Pollution Research and Control Act *- United States Coast Guard (USCG)*	• The Act to Prevent Pollution from Ships (APPS) was amended by the Marine Plastic Pollution Research and Control Act of 1987, which implemented the provisions of Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL) relating to garbage and plastics. • The discharge of plastics, including synthetic ropes, fishing nets, plastic bags, biodegradable plastics, and other food and waste products into the water is prohibited.
National Marine Sanctuaries Act (16 United States Code (USC) 1431 et. seq., as amended by Public Law 104-283)	• This act identifies and designates as national marine sanctuaries areas of the marine environment that are of special national significance and manages these areas as the National Marine Sanctuary System; • Authorizes for comprehensive and coordinated conservation and management of these marine areas, and activities affecting them, in a manner that complements existing regulatory authorities and maintains the natural biological communities in the national marine sanctuaries, and protects and, where appropriate, restores and enhance natural habitats, populations, and ecological processes.
National Invasive Species Act of 1996	• Prevents the introduction and establishment of non-indigenous invasive species throughout the waters of the U.S. that cause economic and ecological degradation to the affected near shore regions. • Compliance with and effectiveness of the guidelines will be reviewed periodically by the Secretary of Transportation.
Marine Protection, Research and Sanctuaries Act (MPRSA) *-USEPA*	• Regulates the dumping of all types of materials into ocean waters to prevent or strictly limit the dumping into ocean waters of any material that would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities. MPRSA is sometimes referred to as the Ocean Dumping Act (ODA), an amendment enacted in 1988. • Unless authorized by a permit, MPRSA generally prohibits (1) transportation of material from the U.S. for the purpose of ocean dumping (2) transportation of material from anywhere for the purpose of ocean dumping by U.S. agencies or U.S.-flagged vessels; and (3) dumping of material transported from outside the U.S. into the U.S. territorial sea or into a contiguous zone (12 NM [13.8 miles or 22.2 km] from the base line) to the extent that it may affect the territorial sea or the territory of the United States.
Oil Pollution Act of 1990 *- USCG*	• Seeks to prevent and better respond to oil spills. • Prohibits a visible sheen or oil content greater than 15 parts per million within 10.4 NM (12 miles or 19 km) of shore. • Requires that oily waste be retained onboard and discharged at an appropriate reception facility. • Requires the development of a facility-specific Spill Prevention, Control, and countermeasures (SPCC) Plan for the management of fuels and hazardous materials.

Table 4.7-7 Major Laws, Regulatory Requirements, and Plans for Biological Resources - Marine

Law/Regulation/Plan/ Agency	Key Elements and Thresholds; Applicable Permits
Migratory Bird Treaty Act - *USFWS*	• Defined Federal prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, at any time, or in any manner, any migratory bird, or any part, nest, or egg of any such bird." (16 USC 703)
State	
California Endangered Species Act (CESA) - *CDFG*	• Establishes a petitioning process for the listing of threatened or endangered species. The California Department of Fish and Game is required to adopt regulations for this process and establish criteria for determining whether a species is endangered or threatened. The California Code of Regulations, tit. 14 §670.1(a) sets forth the required contents for such a petition. • Prohibits the "taking" of listed species except as otherwise provided in State law. Unlike its Federal counterpart, the CESA applies the take prohibitions to species petitioned for listing (state candidates).
California Species Preservation Act of 1970 - *CDFG*	• The California Fish and Game Commission shall establish a list of endangered species and a list of threatened species. The commission shall add or remove species from either list if it finds, upon the receipt of sufficient scientific information pursuant to this article, that the action is warranted.
Lempert-Keene-Seastrand Oil Spill Prevention and Response Act - *CDFG*	• Requires the Administrator of the Office of Oil Spill Prevention and Response (OSPR), California Department of Fish and Game to establish rescue and rehabilitation stations for sea birds, sea otters, and other marine mammals.
California Harbors and Navigation Code, Section 1-7340 - *CDFG*	• Describes and defines provisions and legislative policy for California harbors, navigable waters, traffic, cargo, wrecks and salvage, marinas, construction/improvements, and harbor and port mitigation.
California Fish and Game Code -*CDFG*	It is the policy of the state to conserve, protect, restore, and enhance any endangered species or any threatened species and its habitat; it is the intent of the Legislature, consistent with conserving the species, to acquire lands for habitat for these species.
Coastal Act Section 30230 – Marine Resources - *CCC*	Marine resources shall be maintained, enhanced, and where feasible restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will maintain the biological productivity of coastal waters and that will maintain healthy populations of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.
Coastal Act Section 30240 – Environmentally Sensitive Habitat Area - CCC	• Environmentally sensitive habitat areas shall be protected against and significant disruption of habitat values, and only uses dependent on those resources shall be allowed in those areas. Development in areas adjacent to environmentally sensitive areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.

Table 4.7-7 Major Laws, Regulatory Requirements, and Plans for Biological Resources - Marine

Law/Regulation/Plan/ Agency	Key Elements and Thresholds; Applicable Permits
Water Quality Control Plan for Ocean Waters of California - *SWRCB*	• This plan is applicable, in its entirety, to point source discharges to the ocean. Nonpoint sources of waste discharges to the ocean are subject to Chapter I Beneficial Uses, Chapter II - WATER QUALITY OBJECTIVES, and Chapter III - PROGRAM OF IMPLEMENTATION Parts A.2, D, E, and H.
Local Regulations	
There are no known local ordinances or regulations that protect specific marine habitats or species in the vicinity.	

4.7.3 Significance Criteria

4.7.3.1 All Living Marine Resources

For the purposes of the draft EIS/EIR, impacts to all living marine resources, including plants, invertebrates, fish, sea turtles, seabirds, and marine mammals, are considered significant if the Project:

- Substantially adversely affects, either directly or through habitat modifications, any species identified as a listed, candidate, sensitive, or special status species in local or regional plans, policies, or regulations or by the CDFG or USFWS.
- Degrades the quality of the environment, substantially reduces the habitat of marine biota species, causes marine biota species to drop below self-sustaining levels, threatens to eliminate an animal (fish) community, or reduces the range of a rare or endangered species.
- Alters or destroys habitat that prevents re-establishment of biological communities that inhabited the area prior to the Project.
- Destroys or disturbs on a long-term basis (more than two years) biological communities or ecosystem relationships.
- Changes marine biological resources for periods:
  - Longer than a month for toxicological impacts (e.g., those caused by oiling events or toxicity caused by the discharge of drilling muds and cuttings).
  - Longer than two years for impacts caused by habitat disturbance (e.g., construction activities) or habitat reduction (e.g., damage to hard-bottom structures during construction activities).
- Causes impacts resulting in significant adverse, long-term biological effects on a population or habitat.
- Exposes marine life to contaminants that could cause acute toxicity or bioaccumulation.

4.7.3.2 Fish and Invertebrates

For the purposes of the draft EIS/EIR, impacts specific to fish and invertebrates are considered significant if the Project:

- Reduces quality and/or quantity of EFH as defined by the Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267). Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of or injury to benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH.
- Interferes substantially with the movement of any resident or migratory fish or impedes the use of estuary or nursery sites.
- Introduces new, invasive, or disruptive aquatic species in the area.
- Conflicts with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat plan.
- Reduces fishing areas that have been historically important to the commercial and/or the recreational fishing industries such that regional fishery revenues are reduced, including:
  - Lost harvesting time due to harbor closures;
  - Impacts on living marine resources and habitat; and
  - Equipment or vessel loss or damage.

4.7.3.3 Marine Mammals

For the purposes of the draft EIS/EIR, impacts specific to marine mammals are considered significant if the Project:

- Causes injury or mortality or results in an action that could be considered a Level A take under the MMPA (defined as any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild).
- Causes a Level B take of a listed or candidate species or a Level B take of significant numbers (more than 10) of marine mammals (defined as harassment having the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering).
- Causes substantial deviations (more than 1 NM [1.15 miles or 1.9 km]) of migration routes for significant numbers (more than 10) of marine mammals.

4.7.3.4 Seabirds

For the purposes of the draft EIS/EIR, impacts specific to seabirds are considered significant if the Project:

- Causes injuries or mortalities to substantial numbers (more than 10) of non-listed sea birds.
- Causes substantial deviations (more than 1 NM [1.15 miles or 1.9 km]) of migration routes for significant numbers (more than 10) of sea birds.

4.7.3.5 Sea Turtles

For the purposes of the draft EIS/EIR, all impacts to sea turtles are considered significant if the Project:

- Substantially adversely affects, either directly or through habitat modifications, any species identified as a listed, candidate, sensitive, or special status species in local or regional plans, policies, or regulations or by the CDFG or USFWS.

- Degrades the quality of the environment, substantially reduces the habitat of marine biota species, causes marine biota species to drop below self-sustaining levels, threatens to eliminate an animal community, or reduces the range of a rare or endangered species.

4.7.4 Impact Analysis and Mitigation

Impacts and mitigation measures associated with marine biology are summarized in Table 4.7-8. Applicant-proposed measures (AMM) and agency-recommended mitigation measures (MM) are defined in Section 4.1.

Table 4.7-8 Summary of Marine Biology Impacts and Mitigation Measures

Impact	Mitigation Measure(s)
BioMar-1: Construction activities could alter EFH or sensitive habitats (beach spawning areas or hard bottom substrate) such that fish reproduction could be reduced or that prey species could be eliminated (Class II).	**MM BioMar-1a. Monitoring.** If intertidal beach work occurs between February and September, a qualified biologist will monitor the beach within 100 feet (30 m) of the route during the two weeks prior to installation. If a spawning event occurs during the two weeks prior to construction activities, installation will be delayed until the grunion eggs have hatched (approximately two weeks). A qualified biologist will determine the day in which construction can begin again after the spawning event. **MM BioMar-1b. Avoidance.** Although recent surveys of the Project site have not identified any hard bottom areas, any unexpected hard bottom habitats encountered during construction shall be avoided.
BioMar-2: Construction and/or operational activities could disrupt marine biota behavior,	None.

Table 4.7-8 Summary of Marine Biology Impacts and Mitigation Measures

Impact	Mitigation Measure(s)
resulting in cessation or reduction of feeding or reproduction, area avoidance, or changes in migration patterns (Class III)**.**	
BioMar-3: A release of drilling muds and bentonite into the subtidal environment during HDD could cause temporarily increased turbidity. Increases in turbidity at the offshore exit point could cause fish to avoid this area (Class II).	**MM WAT-5a. HDD Contingency Plan.** The Applicant shall develop a release of drilling muds contingency plan to minimize the potential for releases of drilling muds. **MM WAT-5b. Strategic Location for Drilling Muds and Cuttings Pit.** The Applicant shall ensure a pit has been excavated at the exit hole to collect and contain the drilling muds and cuttings.
BioMar-4: Construction activities associated with pipeline and mooring installation could temporarily disturb soft substrate sediments and could bury or crush sessile marine biota such as benthic invertebrates (Class III).	None.
BioMar-5: Oil or fuel spills during construction or operation or LNG spills could cause morbidity or mortality of marine biota, including fish, invertebrates, sea birds, sea turtles, through direct contact or ingestion of the material (Class II).	**MM BioMar-5a. Control Measures.** Control measures shall be instituted on the FSRU, including systems to prevent or limit releases, proper drainage, emergency shutdown systems and depressurizing systems, and spill containment systems to prevent the potential risk of an accidental release of any hazardous materials.
BioMar-6 A discharge of bilge water, graywater, or deck runoff from the FSRU or from the LNG tankers could result in the release of contaminants into the marine environment. A release of contaminants could cause mortality or morbidity of fish and/or benthic communities (Class III).	**AMM BioMar-6a. Treatment of Discharge Water.** The Applicant would treat graywater and sewage in chemical or biological sanitary waste systems pursuant to NPDES requirements before discharge. Runoff from the deck would be treated using an oil and water separator. **AMM HAZ-2a. Manage Used Oil in Accordance with USEPA and State Requirements.** Hazardous materials to be managed in accordance with facility-specific SPCC Plan **AMM HAZ-5a. Spill Prevention Countermeasure and Control Plan.** Train workers to recognize and respond to spills and notify regulatory agencies; maintain emergency spill kit.
BioMar-7: A release of ballast water containing exotic species could introduce exotic species that directly compete with native organisms, affecting the viability of native species (Class III).	**AMM BioMar-7. Compliance with Regulations.** The Applicant would conduct discharges from the FSRU and LNG tankers in compliance with all applicable State and Federal regulations.
BioMar-8: Commercially important fish species could potentially avoid the Project site due to increased human activity and Project-related noise. Additionally, fish and other benthic species could be attracted to the low relief habitat provided by the subsea pipeline decreasing abundance in other heavily fished areas (Class III)**.**	None.
BioMar-9: Construction and operation vessels	**AMM BioMar-9a**. **Avoid Offshore Construction**

Table 4.7-8 Summary of Marine Biology Impacts and Mitigation Measures

Impact	Mitigation Measure(s)
could collide with marine mammals or sea turtles resting on the ocean surface, resulting in injury or mortality (Class III).	**During Migration Season.** The Applicant would conduct offshore construction activities outside the gray whale migration season (June 1-November 30). **AMM BioMar-9b**. **Marine Mammal Monitoring**. All construction and operational vessels would carry two qualified marine monitors to provide a 360-degree view and watch for and alert vessel crews of the presence of marine mammals during construction activities.
BioMar-10: Noise from construction and operation vessels or equipment could disrupt migrations; interfere with or mask communications, prey and predator detection, and/or navigation; cause adverse behavioral changes; or result in temporary or permanent hearing loss (Class III).	**AMM BioMar-9a. Avoid Offshore Construction During Migration Season**. The Applicant would conduct offshore construction activities outside the gray whale migration season (June1- November 30).. **AMM BioMar-9b. Marine Mammal Monitoring.**
BioMar-11: Marine mammals or sea turtles could become entangled in construction or operation equipment, causing injury or mortality (Class II).	**AMM BioMar-9b. Marine Mammal Monitoring** also applies here. **MM BioMar 11-a. Deployment of Potentially Entangling Material.** Any material that has the potential for entangling marine mammals or sea turtles shall be deployed only as long as necessary to perform its task, and then immediately removed from the Project site. **MM BioMar 11b. Notification.** In the unlikely event that a marine mammal or sea turtle is entangled, the operator shall immediately notify the stranding coordinator at NOAA Fisheries so that a rescue effort may be initiated.
BioMar-12: .A release of LNG, natural gas, fuel, or oil could cause injury or mortality of marine mammals through direct contact or ingestion of the material (Class II).	**MM BioMar-5a. Control Measures**.
BioMar-13: Lights and debris from the FSRU and vessels could attract marine mammals, sea turtles, or seabirds, rendering them vulnerable to other impacts such as collision, noise, entanglement, spills, and predation (Class II).	**MM BioMar-13a. Construction/Operations Lighting Control.** A plan shall be submitted for approval by the USCG and the CSLC with review by local governments at least sixty days prior to construction.
BioMar-14: Construction or operational activities could alter sensitive habitats such that marine mammal, sea turtle, or seabird reproduction could be reduced, prey species could be eliminated, or animals might avoid an area (Class III).	None.

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Offshore

Impact BioMar-1: Temporary or Permanent Alteration or Disturbance of EFH or Sensitive Habitats

Construction activities could alter EFH or sensitive habitats (beach spawning areas or hard bottom substrate) such that fish reproduction could be reduced or that prey species could be eliminated (Class II).

Construction

The BHP Billiton Pipeline and Anchorage Area Study (Fugro 2004) summarizes the multi-phase site investigation conducted to identify site conditions for the proposed Project to optimize proposed facility locations. The primary components of the site investigation included multibeam echosounder bathymetry mapping, acoustic imagery mapping, and shallow penetration high-resolution geophysical surveying and seafloor sampling.

According to the Fugro report, the proposed pipeline route traverses areas containing surficial soils consisting of dense sand and silty sand in the nearshore area, sandy silts and silts near the shelf edge, and fine grain to clays on the upper ridge slopes. The FSRU mooring would be located at approximately latitude 33º 51.52'N and longitude 119º 02.02'W, above the lower Hueneme Fan in areas that are hummocky to flat containing a thin clay layer overlying hard or dense turbidite deposits (Fugro 2004).

These recent surveys, conducted between June 2003 and January 2004, of the entire pipeline route and FSRU anchorage area (as defined in Section 2.0, "Project Description"), indicate that hard substrate habitats do not occur within the Project site (Fugro 2004). The pipeline could likely provide some relief to an otherwise low relief bottom, thus providing a beneficial effect on species found in these areas.

EFH species such as coastal pelagics, highly migratory species, and salmon are highly mobile and would be able to avoid activities during pipeline installation. Species temporarily avoiding the area during construction are expected to return after installation activities have been completed. Impacts to these EFH managed species would be temporary and would not exceed the significance criteria.

The CDFG code defines "grunion" as a fish, larvae, or egg, and any take of a grunion during April or May is prohibited. Grunions leave the water at night to spawn on the beach in the spring and summer months two to six nights after the full and new moons. Spawning begins after high tide and continues for several hours. Spawning occurs from March through August and occasionally in February and September. The peak spawning period is between late March and early June. The shore crossing beneath the sandy beach and nearshore areas of Ormond Beach would be installed using horizontal directional drilling (HDD) and would avoid adverse effects on grunion. This would be a significant adverse impact that would be eliminated or reduced below the significance criteria through mitigation measures identified below.

Operation

The FSRU would be constantly exchanging ballast water to maintain its draft and trim during both loading of LNG from carriers and exporting of natural gas to shore using a computer-controlled ballast water management system, which is designed to constantly monitor load conditions and either intake or discharge seawater as necessary. The ballast water will be obtained from, and discharged to, the ocean in the same location adjacent to the FSRU and no chemicals would be added; therefore, treatment of the ballast water will not be necessary.

Ballast pumps are located at the bottom of the FSRU hull, about 43 feet (13 m) below the water line and would be screened to minimize entrainment of aquatic organisms. The seawater intake would have two mesh screens; the outside screen would have a diameter of 0.5 inches (1.3 centimeters [cm]) and the inner mesh screen would have a diameter of about 0.25 inches (0.6 cm). Under normal production rates, the required volumes would be approximately 15,000 to 20,000 metric tons of ballast per day. Generally, for a typical 4.9 million cubic foot (140,000 m^3) LNG cargo taken onboard over a 24-hour period, the net amount of ballast taken onboard over any 24-hour period would approximately be equal to 50,000 to 55,000 metric tons.

Although the ballast water will not be treated, it is expected that any entrained or impinged organisms would suffer 100% mortality. However, based on the amount of ballast water that would be exchanged during operations, and the depth and location of the ballast water pumps, it is not expected that there will be a significant impact to ichthyoplankton or EFH.

Mitigation Measures for Impact BioMar-1: Temporary or Permanent Alteration or Disturbance of EFH or Sensitive Habitats

MM BioMar-1a. **Monitoring.** If intertidal beach work occurs between February and September, a qualified biologist will monitor the beach within 100 feet (30 m) of the route during the two weeks prior to installation. If a spawning event occurs during the two weeks prior to construction activities, installation will be delayed until the grunion eggs have hatched (approximately two weeks). A qualified biologist will determine the day in which construction can begin again after the spawning event.

MM BioMar-1b. **Avoidance.** Although recent surveys of the Project site have not identified any hard bottom areas, any unexpected hard bottom habitats encountered during construction shall be avoided.

Implementation of these measures will reduce impacts to a less than significant level.

Impact BioMar-2: Disruption of Marine Biota Behavior

Construction and/or operational activities could disrupt marine biota behavior, resulting in cessation or reduction of feeding or reproduction, area avoidance, or changes in migration patterns (Class III).

Construction

The existing sound levels 12.2 NM (14 miles or 22.5 km) offshore vary depending on weather conditions and ship traffic. However, the final Environmental Impact Statement for the nearby Point Mugu Sea Range (U.S. Department of Navy Naval Air Warfare Center Weapons Division 2002) characterized the area's average baseline noise levels at 50 to 55 decibels on the A-weighted scale (dBA). As discussed in Subsection 4.3, "Maritime Traffic," more than 5,000 commercial vessels transit the area annually. Fishing and recreation vessels also are found in the area.

Noise generated by vessel traffic and other installation activities could cause avoidance behaviors in fish within the area and surrounding areas. Fish appear to be very sensitive to noise, particularly at low frequencies. However, sensitivity appears to be dependent upon distance (National Oceanic and Atmospheric Administration 2004). Noise impacts on fish and other marine biota during construction activities would be temporary, would occur only during these activities, and would not exceed the significance criteria.

Operation

The FSRU is stationary and would produce a relatively constant noise signal. Additionally, the slow approach of LNG carriers to the FSRU would likely produce a similar steady signal that would increase as they approach the FSRU. The operation of these vessels would not likely produce startle or alarm reactions in fish. (See Impact BioMar-10 below for more detailed discussion on noise-related impacts.) Potential impacts on fish species related to noise levels during operations would not exceed the significance criteria.

Mitigation Measures for Impact BioMar-2: Disruption of Marine Biota Behavior

No mitigation is identified due to the temporary nature of any impacts on marine fish**.**

Impact BioMar-3: Temporary Avoidance of the Area Due to HDD Release of Drilling Muds

A release of drilling muds and bentonite into the subtidal environment during HDD could cause temporarily increased turbidity. Increases in turbidity at the offshore exit point could cause fish to avoid this area (Class II).

The primary impact that could occur during HDD activities is an inadvertent release of drilling mud directly into the ocean and subtidal waters, causing increased turbidity. Although drilling mud comprises naturally occurring, non-toxic materials (bentonite clay),

the release of large quantities into the subtidal zone could affect fishes and other aquatic biota such as benthic organisms by settling and temporarily inundating habitats required by these species. There would be a local and temporary increase in turbidity. Because they are heavier than the saltwater, the bentonite and drill cuttings would immediately settle on the seafloor, potentially smothering benthic organisms. Impacts to fish would be temporary. Impacts to benthic species would be short-term, with communities rebounding within a year in impacted areas. Monitoring, response, documentation, and notification plans within the HDD Contingency Plan would minimize the potential environmental effects of the HDD operation and any potential releases of drilling mud.

Mitigation Measures for Impact BioMar-3: Temporary Avoidance of the Area Due to Release of Drilling Muds

The following measures also apply here:

MM WAT-5a. **HDD Contingency Plan** (see Section 4.18, "Water Quality and Sediments).

MM WAT-5b. **Strategic Location for Drilling Muds and Cuttings Pit** (see Section 4.18, "Water Quality and Sediments).

Overall impacts on both communities would be negligible, considering the limited area impacted by an event, and implementation of the proposed mitigation measures would reduce impacts to less than significant.

Impact BioMar-4: Burial of Sessile Marine Biota

Construction activities associated with pipeline and mooring installation could temporarily disturb soft substrate sediments and could bury or crush sessile marine biota such as benthic invertebrates (Class III).

Construction

Increased turbidity during pipeline and mooring installation activities could clog filter-feeding mechanisms used by some benthic organisms. Additionally, installation of the pipeline and mooring could disturb or cause direct harm (crush) benthic organisms that occur in soft bottom habitats within the footprint. Short-term impacts to the infaunal community are not likely to last more than six to 12 months (Lindebroom and deGroot 1998). Re-establishment rates for infaunal organisms occurring in deeper ocean areas are not well known. The impact area on the seafloor during installation of the subsea pipeline is 18.3 NM (21.1 miles or 34 km), or approximately 511 total acres (207 ha). Because the area of impact is limited to the pipeline footprint, the impact area is limited and re-colonization is expected to occur rapidly. The impact to sessile marine organisms would be temporary and would not exceed the significance criteria.

Operation

Once installed on the seafloor, the pipeline would provide hard substrate and relief habitat for marine invertebrates and fishes, providing a beneficial impact for those species dependant on these habitats.

Mitigation Measures for Impact BioMar-4: Burial of Sessile Marine Biota

Impacts to benthic communities would be short-term and benthic communities would rebound within a year therefore this is a less than significant impact and no mitigation measures are identified.

Impact BioMar-5: Mortality and Morbidity of Marine Biota from Spills

Oil or fuel spills during construction or operation or LNG spills could cause morbidity or mortality of marine biota, including fish, invertebrates, sea birds, sea turtles, through direct contact or ingestion of the material (Class II).

Construction

An accidental release of diesel, oil, or other toxic substances during construction activities could disturb foraging activities, migration patterns, and spawning events or cause direct harm to marine species and habitats. A small release of fuel oils may effectively narcotize invertebrate species, making them more susceptible to predation. Due to their size and mobility, fish species are less likely to be affected by such a release. Any such release would float and disperse from the immediate spill area and would affect only a small number of individual species. Any potential impacts from an accidental small-quantity release would be short-term and would be mitigated to below significant levels with implementation of the below measures.

Operation

The potential impacts of an accidental release of diesel, oil, and other toxic substances during operation would be the same as those during construction, as discussed above.

The effects of an accidental release of LNG into the ocean water would be short-term. The LNG would dissipate quickly in the atmosphere and little to no residual product would remain in the ocean habitat. For most moderate spill scenarios, LNG would vaporize within minutes of release, forming a cloud of natural gas. As this cloud forms, parts of the cloud will be at concentrations of natural gas that are high enough to cause asphyxiation of seabirds on the surface or flying low over the area. This potential will diminish over time as the cloud continues to mix with ambient air, which results in dilution of the gas. The period of time and the potential area impacted for which asphyxiation would be a concern depends on a number of factors, e.g., the amount released and the weather and sea conditions at the time of a release. Computer modeling for such releases has not been conducted. Modeling conducted to define potential impacts on public safety (see Section 4.2, “Public Safety”) incorporated assumptions that would lead to worst-case scenarios for impacts above the ocean

surface. No estimates of the potential subsea acoustic impacts from rapid phase transition of LNG have been developed.

Should the gas plume ignite, seabirds on the surface or flying low over the area would be killed outright. Seabirds flying near the flames could suffer some singeing of feathers, compromising their ability to fly and their ability to stay warm. They could also suffer respiratory damage if superheated air were ingested. Radiated heat from an ignition, both above and near the flames, could cause a variety of problems such as overheating and exhaustion. Any organisms that surfaced to breathe in the ignition area could be burned on exposed surfaces and suffer from searing in the respiratory passages. The severity of such impacts would depend upon the amount of exposure received by an animal. Residual effects could include pneumonia as a result of damage to the respiratory system, as well as infection and other complications. If a catastrophic ignition were to occur, blast effects would be expected.

Seabirds, especially diving birds, are extremely vulnerable to oil and fuel spills. Oil clogs the fine strands of the feathers, which shed water and trap air for insulation (Holmes and Chronshaw 1977). Once this occurs, the metabolic rate increases, the fat reserves are expended and progressively more energy is consumed, resulting in death (Hartung 1967; Croxall 1977). Also, once the feathers are fouled, buoyancy is reduced, resulting in even greater expenditures of energy (Briggs et al. 1997).

Oiled seabirds generally preen, ingesting oil in the process. Aliphatic compounds may concentrate in the liver, resulting in adverse behavioral effects (Kuletz 1997). Numerous inflammatory and toxic impacts on internal organs can be manifested (Leighton 1991). Oil in the gastrointestinal system can result in limited absorption of nutrients (Briggs et al. 1997).

Due to the location of the FSRU approximately 12.2 NM (14 miles or 22.5 km) offshore in waters approximately 2,900 feet (884 m) deep, it is not likely that large numbers of birds or fish species would be present within impact areas projected for a large spill of LNG or other worse case scenario modeling.

Considering the absence of sea turtle sighting reports at or near the Project site, the fact that most sightings in the Southern California Bight are at the limits of their range (except for the leatherback sea turtle) and that sea turtle feeding habitats are not present at the Project site, it is extremely unlikely that any sea turtles would be impacted by an oil or fuel spill.

Mitigation Measures for Impact BioMar-5: Mortality and Morbidity of Marine Biota from Spills

MM BioMar-5a. **Control Measures.** Control measures shall be instituted on the FSRU, including systems to prevent or limit releases, proper drainage, emergency shutdown systems and depressurizing systems, and spill containment systems to prevent the potential risk of an accidental release of any hazardous materials. A detailed

SPCC Plan shall be developed and approved before beginning construction activities and shall be implemented during construction and operation activities. The SPCC shall be submitted to the USCG and the CSLC at least 60 days prior to initiation of Project construction.

Project design shall comply with all applicable regulations to minimize the potential for LNG spill occurrence, and emergency response plans shall be prepared. Mitigation measures for reducing the potential risk of an accidental release of oil, fuel, or LNG are detailed in Subsection 4.12, "Hazardous Materials," and Subsection 4.2, "Public Safety."

All construction and operational vessels shall comply with the following measures:

- Oil and fuel spill response plans shall be formulated and submitted to the regulatory agencies for review and approval prior to construction and operation. These plans shall include:
  - Identification of responsible parties;
  - Training requirements for vessel crews;
  - Agency notifications in the event of a spill;
  - Identification of oil and fuel cleanup resources in the event of a substantial spill;
  - Oil and fuel spill containment, cleanup, and disposal equipment;
  - Identification of approved disposal methods and sites;
  - HAZMAT safety issues; and
  - Wildlife rescue resources.
- All vessels shall carry absorbent pads and other cleanup materials as well as personnel safety equipment and approved containers for soiled materials.
- Crew boats, tugs, and other small craft routinely present at or near the construction site or at the FSRU shall carry absorbent booms and other containment equipment as well as approved storage containers for soiled materials. Oil and fuel spill response units shall be available in the event of a significant spill and shall be capable of responding within hours of notification.

With the implementation of these measures, impacts from an accidental release of LNG would be mitigated to a level below significant.

Impact BioMar-6: Discharge of Bilge Water, Graywater, and Deck Runoff

A discharge of bilge water, graywater, or deck runoff from the FSRU or from the LNG tankers could result in the release of contaminants into the marine environment. A release of contaminants could cause mortality or morbidity of fish and/or benthic communities (Class III).

Construction

An accidental release of hazardous materials (potentially contained in deck runoff), bilge water, or graywater from the FSRU or from the LNG tankers could have a direct impact on the marine environment and marine species. Due to their size and mobility, fish species are not likely to be directly affected by such a release. Any such release would float or disperse from the immediate spill area and would affect only a small number of individual species. The Applicant would obtain National Pollutant Discharge Elimination System (NPDES) permits through the USEPA Region 9 for any regulated discharges (see Table 4.18-5 in Subsection 4.18, "Water Quality," for NPDES permit information). Any potential impacts from an accidental small quantity release would be short-term and less than significant after implementation of the proposed mitigation measures. Treating wastes and runoff before discharge would reduce the impacts to less than significant.

Operation

Impacts during operation activities would be similar to those identified under *Construction*.

The Applicant has incorporated the following into the proposed Project:

AMM BioMar-6a. **Treatment of Discharge Water.** The Applicant would treat graywater and sewage in chemical or biological sanitary waste systems pursuant to NPDES requirements before discharge. Runoff from the deck would be treated using an oil and water separator.

Mitigation Measure for Impact BioMar-6: Discharge of Bilge Water, Graywater, and Deck Runoff

AMM HAZ-2a. **Manage Used Oil in Accordance with USEPA and State Requirements** also applies here (see Section 4.12, "Hazardous Materials").

AMM HAZ-5a. **Spill Prevention Countermeasure and Control Plan** also applies here (see Section 4.12, "Hazardous Materials").

With the implementation of these measures, the impact will be less than significant.

Impact BioMar-7: Discharge of Ballast Water

A release of ballast water containing exotic species could introduce exotic species that directly compete with native organisms, affecting the viability of native species (Class III).

Construction

Before initial arrival of the FSRU from the overseas fabrication port, the FSRU would follow established ballast water exchange protocol in accordance with MARPOL, State, and USCG requirements, including notification and exchange of ballast water outside the 200-NM (230 miles or 371 km]) exclusive economic zone (EEZ) limit and potential impacts will be less than significant (Class III).

Operation

During normal FSRU operations, the key management criterion for ballast water is that the FSRU would be operated at nearly constant draft. Any LNG inventory changes would need to be offset by ballast water pumping. Under normal production rates, the required intake volumes would be approximately 15,000 to 20,000 metric tons (15,000,000 to 20,000,000 kg) of ballast per day. Considering that a typical 4.9 million cubic foot (140,000 m^3) LNG cargo is taken onboard over a 24-hour period while the LNG carrier continues to send gas to shore over that same 24-hour period, the net amount of ballast taken onboard over that 24-hour period would be approximately 50,000 to 55,000 metric tons (50,000,000 to 55,000,000 kilograms). Ballast water would not be chemically treated.

Ballast water from LNG carriers would be exchanged outside the 200 NM (230 miles or 371 km) limit according to regulations. While offloading the LNG cargo, the carriers would pump ballast water into their tanks to compensate for the weight of LNG being discharged to the FSRU. Based on the assumption that any discharges would be conducted in compliance with all applicable State and Federal regulations and that routine ballast water exchanges during operation of the FSRU would contain only water obtained on-site, no significant impacts to the marine environment or directly to marine biota are anticipated (Class III).

The Applicant has incorporated the following into the proposed Project:

AMM BioMar-7a: Compliance with Regulations. The Applicant would conduct discharges from the FSRU and LNG tankers in compliance with all applicable State and Federal regulations.

Mitigation Measures for Impact BioMar-7: Discharge of Ballast Water

No additional mitigation measures are identified for impacts from discharges of ballast water. The FSRU (prior to installation) and LNG carriers (at all times) would exchange ballast water outside the 200 NM (230 miles or 371 km) limit, in compliance with State and Federal requirements, thereby avoiding significant impacts.

Impact BioMar-8: Increase/Decrease in Fish Abundance or Commercially Important Benthic Species (Class III).

Commercially important fish species could potentially avoid the Project site due to increased human activity and Project-related noise. Additionally, fish and other benthic species could be attracted to the low relief habitat provided by the subsea pipeline decreasing abundance in other heavily fished areas (Class III).

Construction

It is expected that most species of fish would temporarily avoid the construction areas near the pipeline and mooring point during construction activities due to disturbances of the sediment and to noise. These marine species would quickly return to the area once construction activities and noise subside and any impacts would be temporary and would not be significant.

Operations

For safety purposes a 1,640-foot (500 m) safety zone surrounding the FSRU would be enforced. The exclusion of fisherman from fishing grounds in the safety zone could increase fish abundance within the exclusion zone. Additionally, fishing pressure could increase in areas where fishing is not precluded, resulting in a decrease in fish abundance in areas outside the safety zone. Due to the mobility of fish species and the size of the exclusion zone, a significant increase in fish congregation in the immediate area surrounding the FSRU and subsea pipeline is not expected and thus would not affect fishing pressure or catch abundance.

An epiphytic community would most likely develop on any hard structures such as the pipeline. This would in turn result in enhanced habitat for demersal fish and benthic community organisms outside the FSRU safety zone, attracting fish to these areas outside the safety zone, providing a beneficial impact.

Mitigation Measure(s) for Impact BioMar-8: Increase/Decrease in Fish Abundance or Commercially Important Benthic Species

No specific mitigation measures are proposed because rapid recolonization is expected around the pipeline and mooring points following construction activities and therefore this impact is less than significant.

Impact BioMar-9: Collision between Project Vessels and Marine Mammals or Sea Turtles

Construction and operation vessels could collide with marine mammals or sea turtles resting on the ocean surface, resulting in injury or mortality (Class III).

Subsection 4.3, “Marine Traffic,” provides a detailed description of the marine vessels expected to be used during construction and operation activities for the proposed Project. Two anchor-handling tug supply vessels (15,000 horsepower [Hp]) would tow

the FSRU from the fabrication site to the mooring location. Two barges would transport anchors and equipment to the mooring location, and two supply vessels (at 4,500 Hp each) would transport materials and crew. Mooring installation would occur over a 45-day period on a 24-hour per day basis. During normal operations, the FSRU would receive LNG carriers two to three times per week, weather permitting; therefore, there would be between 104 and 156 LNG carrier visits at the port annually.

Collisions with large whales usually involve ships rather than small craft. Modern merchant vessels, including LNG carriers, have a bulbous bow section that protrudes forward underwater. On a few occasions, merchant vessels have entered ports, including Los Angeles-Long Beach, with dead whales draped over the bulbous bow section (Cordaro 2002). In other cases, dead whales showing slashes from large propellers have drifted ashore (Woodhouse, pers. comm. 1996).

The bulbous bow virtually eliminates the bow wake, producing greater speed and efficiency. Since the wake is almost nonexistent, noise is also reduced, rendering the bow of the ship very quiet, particularly if ambient sounds such as whitecaps mask sounds from the bow. The propeller(s) and engines are located toward the stern, so the primary source of noise is far removed from the bow. LNG carriers range to at least 942 feet (287 m) in length (slightly longer than the FSRU). Considering the length of LNG carriers, this means that the primary noise source is some distance from the bow. Large LNG carriers in use today carry up to 4.89 million cubic feet (140,000 m^3) of LNG. A vessel capable of carrying 5.42 million cubic feet (153,500 m^3) would be launched in 2005, and others are being designed with capacities of up to 8.8 million cubic feet (250,000 m^3) (Maritime Reporter and Engineering News 2004). Such vessels will be substantially longer; thus, the primary noise source will be even further removed from the bow.

Considering the size of modern ships in general, whales may not perceive the danger of a swiftly approaching ship because the primary noise source may not be close enough to cause alarm. Moreover, modern ships are very fast. Most LNG carriers have design speeds ranging from 19.5 to 21 knots (22.4 to 24.2 miles per hour) (Maritime Reporter and Engineering News 2004), and other modern ships are generally as fast and sometimes even faster.

Most collisions involving small cetaceans, pinnipeds, sea otters, and sea turtles involve small, fast vessels (Cordaro 2002). In small craft the noise source and dangerous parts of the vessel are essentially in the same place. The shaft, strut, and rudder—or outdrive—and the propeller are at or near the stern, but the bow is not far away.

Ship strikes involving marine mammals and sea turtles, although uncommon, have been documented for the following listed species in the eastern North Pacific (NOAA Fisheries and U.S. Fish and Wildlife Service 1998a, 1998b, 1998c, 1998d; Stinson 1984; Carretta et al. 2001):

- Blue whale;
- Fin whale;

- Humpback whale;
- Sperm whale;
- Southern sea otter;
- Loggerhead sea turtle;
- Green sea turtle;
- Olive ridley sea turtle; and
- Leatherback sea turtle.

Ship strikes have also been documented involving gray, minke, and killer whales. Collisions with sei, Bryde's, and North Pacific right whales may have occurred in the eastern Pacific but have not been reported (Carretta et al. 2001; Angliss et al. 2001). Very few ship strikes involving pinnipeds have been reported over the past 28 years by the Santa Barbara Marine Mammal Center (1976-2004). No sea turtle-ship strikes have been reported in the area, although an olive ridley sea turtle stranded in Santa Barbara in 2003 showed signs of blunt force trauma consistent with a vessel strike (Santa Barbara Marine Mammal Center 1976-2004). No collisions have been reported between any oil supply or crew vessels and any cetaceans or sea turtles in the region (Cordaro 2002), although an oil supply vessel struck and presumably killed an adult male northern elephant seal in the Santa Barbara Channel in June 1999 (Minerals Management Service 2001).

Determining the cause of death for marine mammals and sea turtles that wash ashore dead or are found adrift is not always possible, nor is it always possible to determine whether propeller slashes were inflicted before or after death. In the case of the sea otter, wounds originally thought to represent propeller slashes were determined to have been inflicted by great white sharks (*Carcharodon carcharias*) (Ames and Morejohn 1980). In general, dead specimens of marine mammals and sea turtles showing injuries consistent with vessel strikes are not common.

Considering the level of vessel traffic in the region and the paucity of reported vessel strikes or other evidence, it is possible but unlikely that a collision would occur between a Project vessel and a marine mammal or sea turtle. Watches are maintained while vessels are under way. Prudent seamanship includes avoiding all large objects in the path of a vessel, including whales. In the unlikely event that such an impact occurred, it would be considered either a Level A harassment (defined as any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild) or a Level B harassment (defined as harassment having the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering) under the MMPA, depending on whether the animal were injured or not. Impacts would be reduced to below significant with the implementation of the below mitigation measures.

The Applicant has incorporated the following into the proposed Project:

AMM BioMar-9a. **Avoid Offshore Construction During Migration Season.** The Applicant would conduct offshore construction activities outside the gray whale migration season (June 1-November 30).

AMM BioMar-9b. **Marine Mammal Monitoring**. All construction and operational vessels would carry two qualified marine monitors to provide a 360-degree view and watch for and alert vessel crews of the presence of marine mammals during construction activities. During operational activities, supply boats would also carry one qualified marine biological monitor. Additionally:

- The monitors would receive training from a qualified independent marine wildlife mitigation firm approved in advance by NOAA Fisheries in consultation with the CDFG. The training would enable monitors to identify marine mammal and sea turtle species and to understand their behaviors, seasonal migrations, and the importance of avoiding them.
- Monitors would have the authority to stop work until monitors determine there is no longer a threat and/or the animal(s) transits the area if a marine mammal or sea turtle approaches the 100-yard (91.4 m) safety zone or the monitors determine that the Project operations have the potential to threaten the health or safety of marine wildlife or "take" a protected species as defined by regulations implementing the ESA and MMPA.
- Monitors would have no other duty than to watch for marine mammals and sea turtles while each vessel is under way.
- Each monitor would maintain watch for marine mammals and sea turtles at all times while under way. If any whales are observed, the monitor would request the vessel operator to employ the following procedures:
  - Do not approach whales or any threatened or endangered wildlife closer than 1,000 feet (305 m).
  - Approach whales from the side or rear on a parallel course.
  - Do not cross directly in front of the whales.
  - Maintain the same speed as the whales.
  - Do not attempt to herd or drive any whales.
  - If a whale exhibits evasive or defensive behavior, stop the vessel until the whale has left the immediate area.
  - Do not come between or separate a mother and its calf.

  In addition, qualified independent monitors, approved in advance by NOAA Fisheries and CDFG, would be aboard

the pipe-laying vessel while it is deployed at the Project site. The monitors would:

- Establish and maintain communications with the vessel operator at all times.
- Be positioned so that a 360-degree view is maintained.
- Be on watch during all pipe-laying operations, day or night.
- Use night vision or low-light binoculars in reduced light.
- If a collision appears likely, the speed of the vessel shall be reduced as quickly and as much as possible and propulsion machinery engaged only when necessary to maintain position.
- If a collision is likely, monitors and available crew aboard the ship shall take up observation positions to help report sightings to the monitor so that appropriate actions can be taken to avoid collision.

In the unlikely event that a whale is injured, the operator would immediately notify:

- Stranding Coordinator, NOAA Fisheries, Long Beach (562-980-4017)
- Enforcement Dispatch Desk, CDFG, Long Beach (562-590-5133
- Environmental Planning and Management, CSLC, Sacramento (916-574-1890)
- Santa Barbara Marine Mammal Center (805-687-3255)

A detailed written report would be prepared by the monitor and dispatched to NOAA Fisheries, the CDFG, and the CSLC. A final report summarizing the monitoring activities for the Project shall also be provided to the above-mentioned agencies within 60 days of the conclusion of offshore facilities construction.

Mitigation Measures for Impact BioMar-9: Collision between Project Vessels and Marine Mammals or Sea Turtles

No additional mitigation measures are proposed for impacts to marine mammals from vessel collisions; with the implementation of the AMMs, the impact would be reduced to a less than significant level.

Impact BioMar-10: Noise Disrupting Marine Mammal Behavior

Noise from construction and operation vessels or equipment could disrupt migrations; interfere with or mask communications, prey and predator detection, and/or navigation; cause adverse behavioral changes; or result in temporary or permanent hearing loss (Class III).

According to Carretta et al. (2002), increasing levels of manmade noise in the world's oceans has been suggested to be a habitat concern for whales and particularly for baleen whales that may communicate using low-frequency sound. Such sounds may not only affect communications but also may cause whales to divert from normal migration paths or to stop feeding or reproductive activities. Such sounds may also reduce the abilities of marine mammals and sea turtles to detect prey or predators and, in the case of odontocetes, the ability to navigate.

Exposure to very loud sounds or continued exposure to loud noise can result in a temporary (hearing) threshold shift (TTS) or a permanent (hearing) threshold shift in which part or all of an animal's hearing is reduced or eliminated throughout part or all of its hearing range, either temporarily or permanently. With extremely powerful impulse noises such as those generated by explosives, geophysical exploration using airguns, certain sonar equipment, pile driving, and other impulse power sources, physical trauma or mortalities are possible (Richardson et al. 1995). No impulse power sources are anticipated for this Project. A catastrophic failure of one or more LNG tanks could result in a massive release of LNG to the ocean, resulting in some noise. Ignition of such a release could result in a substantial fireball, also generating considerable noise.

No standards have been adapted for acceptable underwater noise levels, although NOAA Fisheries is expected to publish criteria in the near future. The criteria will likely deal with impulse power sources such as underwater explosives, geophysical airguns, pile-driving, and possibly some low- and mid-frequency sonars. Considerable effort has gone into the investigation of ship noise and its effects on marine mammals, but no acceptable levels have been adopted as yet.

Part of the difficulty of setting safe levels of noise for wildlife is that collective knowledge of the hearing sensitivities of various species, both in frequency and intensity, is extremely limited. Moreover, the threshold at which some damage, such as TTS, may be expected is poorly understood for nearly all marine mammal and sea turtle species. Finally, the level at which behavioral responses could be expected is based on assumptions from extremely limited research. Nonetheless, various levels have been proposed and accepted for offshore projects, although such projects have generally involved impulse power sources rather than shipping, construction, or operational sounds. Understanding how underwater sound levels are expressed is vital to assessing and mitigating potential impacts from such sounds. It is also important to understand how different measurements are applied to various potential impacts.

Underwater sound levels are often expressed in decibels (dB), which represent the *intensity* of sound. The decibel scale is not linear, meaning that 200 dB would not be

twice as loud as 100 dB. Instead, it is logarithmic. For every three decibels increase in sound, the intensity doubles; a 10 dB increase represents a tenfold increase in intensity. Decibels have no relevance without a reference pressure, however. The micropascal (µPa) is a unit of pressure often applied to sound levels. One micropascal equals one-millionth of a pascal, and one pascal equals a 1-newton force exerted over 1 m². Underwater sound levels are often expressed as X dB re (reference) 1 µPa, while sounds in air are expressed as X dB re 20 µPa.

Vessel noises are usually transitory and relatively short-lived. Construction vessels, however, may remain on-site for extended periods. Although the noise of such vessels is not always loud, it is persistent. Generators, compressors, deck machinery, and other sound sources contribute to the cacophony of sounds produced by such vessels. Representative vessel sounds described in a noise analysis of construction activities range from 156 to 181 dB re 1µPa – rms (Entrix, Inc. 2004). Dynamic-positioning pipe-laying vessels can be quite loud; such a vessel was easily heard underwater some 15 miles from a construction site (Woodhouse and Howorth 1992). The estimated sound level of such a vessel is 172 dB re 1µPa – rms (Entrix, Inc. 2004) Operational vessels generate steady noises that vary somewhat in intensity, depending upon a given operation.

The FSRU would generate less noise when it is stationary than when the thrusters are in use. Operational octave band levels have been estimated at 145 to 179 dB re 1µPa – m. Total broadband level (22Hz to 11.3 kHz) was estimated at 182 dB re 1µPa – m. This level will fall to 122 dB re 1 µPa I km from the source and will equal background levels at 7 km on a windy day (C.J. Engineering Consultants 2004). The FSRU will generate the most noise when its thrusters are being used and tugs are nudging the LNG carrier into position. The broadband source level when this occurs was estimated at 192.6 dB re 1µPa – m. This would only occur for about two hours each week (C.J. Consultants 2004). These estimates were made utilizing engine manufacturers' noise specifications and factoring in the structural elements of the FSRU design. Noise produced by the LNG carriers would likely be loudest at cruising speeds and reduced in volume when moored and discharging LNG. Similarly, crew and supply vessels will be loudest when under way, but such sounds will be transitory and short-lived. Helicopters will be loudest during approach and takeoff, when they must use maximum power and when they are closest to the water.

Underwater sound levels expressed as X dB re 1 µPa represent the *peak* sound pressure level. Underwater sound pressure levels are sometimes expressed as X dB re 1 µPa – m, which represents the theoretical peak sound pressure level within 1 meter of the source. Such a measurement is useful for estimating sound pressure levels at various ranges from the source. Another measurement, which represents the *average* peak pressure over the duration of a pulse, such as a pulse generated by a geophysical airgun, is expressed as X dB re 1 µPa – rms (root-mean square).

Another measurement, used to express the *energy* of impulse sounds, is expressed as X dB re 1 µPa² - s (second). Energy is proportional to the length of time that sound pressure is applied; thus, this serves as a measure of how long a marine organism can

receive a given amount of energy before it is affected. As an alternative measurement, X psi – ms (pounds per square inch per millisecond) is sometimes used to express the *maximum overpressure* that an animal can receive without injury. This is also applied to impulse sounds.

Several threshold levels—the point at which harassment or injury may occur—have been proposed using these various measurements, although no standards have been adapted. Threshold levels with corresponding applications of these measurements are listed in Table 4.7-9.

Table 4.7-9 Threshold Levels

Threshold Level	Representing	Application(s)	Organisms
180 dB re 1 µPa	Peak pressure	Explosives	Marine mammals
182 dB re 1 µPa² - s	Energy	Explosives	Marine mammals
12 psi – ms	Max. pressure	Explosives	Marine mammals
30 psi – ms	Max. pressure	Explosives	Birds on surface
160 dB re 1 µPa – rms	Average peak pressure	Geophysical airguns	Baleen and sperm whales only
180 dB re 1 µPa – rms	Average peak pressure	Geophysical airguns	Pinnipeds and small cetaceans

No threshold levels have been adapted for continuous noise sources such as those generated by oil production platforms nor for shipping noise. Reactions exhibited by marine mammals and sea turtles to underwater noise from vessels and platforms vary widely. In general, pinnipeds and small cetaceans seem little affected by transitory or continuous noise and may become habituated to it. For example, California sea lions regularly haul out on mooring buoys and lower decks of oil platforms, and several species of dolphins regularly bow-ride vessels moving through the water. Baleen whales generally ignore stationary or distant sounds. If a vessel approaches slowly, with no aggressive moves, whales may shy away from such vessels in subtle ways. Aggressive approaches or sudden changes in course and speed can result in strong avoidance reactions. Sea turtles behave similarly around vessels.

The extent to which an animal responds to a sound source depends not only on the intensity and duration of the sound but also on the frequency of the sound. The collective knowledge of the hearing frequency ranges of various species is extremely limited, however. In many cases, it is based on recordings made of an animal's vocalizations, which likely do not represent the full range of hearing for each species. Thus, one of the few assumptions that might be made is that animals can be harassed by loud noises within the frequency range of their vocalizations. Assumptions should not be made that an animal would not be disturbed by loud noises beyond its range of vocalization; it may still be able to hear such sounds even though it cannot produce them. Moreover, extremely powerful sounds, such as those generated by explosives, can still injure or kill an animal even if the predominant frequencies are beyond the animal's hearing frequency range.

Frequencies are measured in hertz (Hz). One hertz equals one cycle per second, while one kilohertz (kHz) represents 1,000 Hz. Humans with excellent hearing can detect sounds as low as 20 Hz or as high as 20 kHz. Some marine mammals can detect sounds as low as 12 Hz (perhaps even as low as 5 Hz), while others may detect sounds as high as 180 kHz or more (Richardson et al. 1995). The known hearing frequency ranges of most species that occur in the Southern California Bight are summarized in Table 4.7-10. Impacts would be reduced to below significant with the implementation of the mitigation measures.

Sound pressure level limits have not been adopted by the regulatory agencies in regard to commercial shipping or oil and gas production platforms. No levels have been proposed by commercial shipping firms or by the oil and gas industry for their operations.

In numerous offshore projects involving impulse sounds, sound pressure levels have been proposed by various industries, by local and regional governments, and by the military. Various levels have been accepted by the regulatory agencies for each specific project. These levels and the means of measuring them have changed over time. What constitutes acceptable safe standards for exposure to impulse sounds has yet to be adopted by the regulatory agencies. Since no impulse sounds are anticipated during normal construction and operational activities, no mitigation measures are proposed for impulse sounds.

The Applicant has incorporated the following into the proposed Project:

AMM BioMar-9a. **Avoid Offshore Construction During Migration Season** applies here.

AMM BioMar-9b. **Marine Mammal Monitoring** also applies here.

Mitigation Measure(s) for Impact BioMar-10: Noise Disruption of Marine Mammal Behavior

No additional mitigation measures are proposed for impacts to marine mammals from noise impacts; with the implementation of the AMMs, the impact would be reduced to a less than significant level.

Table 4.7-10 Frequency Ranges for Selected Species

Taxa	Common Name	Genus/Species	Frequency Range
Odontocetes	Short-beaked common dolphin	*Delphinus delphis*	500 Hz to 67 kHz
	Short-finned pilot whale	*Globicephala macrorhynchus*	500 Hz to 20 kHz
	Risso's dolphin	*Grampus griseus*	80 Hz to 100 kHz
	Pacific white-sided dolphin	*Lagenoryhnchus obliquidens*	2 kHz to 80 kHz
	Northern right whale dolphin	*Lissodelphis borealis*	1 kHz to 40 kHz
	Killer whale	*Orcinus orca*	500 Hz to 120 kHz
	False killer whale	*Pseudorca crassidens*	1.1 kHz to 130 kHz

Table 4.7-10 Frequency Ranges for Selected Species

Taxa	Common Name	Genus/Species	Frequency Range
	Spotted dolphin	*Stenella attenuata*	3.1 kHz to 21.4 kHz
	Striped dolphin	*Stenella coeruleoalba*	6 kHz to 24 kHz
	Spinner dolphin	*Stenella longirostris*	1 kHz to 65 kHz
	Bottlenose dolphin	*Tursiops truncates*	40 Hz to 150 kHz
	Hubbs' beaked whale	*Mesoplodon carlhubbsi*	300 Hz to 80 kHz
	Blainville's beaked whale	*Mesoplodon densirostris*	1 kHz to 6 kHz
	Pygmy sperm whale	*Kogia breviceps*	60 kHz to 200 kHz
	Sperm Whale	*Physeter macrocephalus*	100 Hz to 30 kHz
	Harbor porpoise	*Phocoena phocoena*	1 kHz to 150 kHz
	Dall's porpoise	*Phocoenoides dalli*	40 Hz to 149 kHz
Mysticetes	Gray whale	*Eschrichtius robustus*	20 Hz to 2 kHz
	Minke whale	*Balaenoptera acutorostrata*	60 Hz to 20 kHz
	Sei whale	*Balaenoptera borealis*	1.5 kHz to 3.5 kHz
	Bryde's whale	*Balaenoptera edeni*	70 Hz to 950 Hz
	Blue whale	*Balaenoptera musculus*	12 Hz to 31 kHz
	Fin whale	*Balaenoptera physalus*	14 Hz to 28 kHz
	Humpback whale	*Megaptera novaeangliae*	20 Hz to 10 kHz
Pinnipeds	Northern fur seal	*Callorhinus ursinus*	4 kHz to 28 kHz
	California sea lion	*Zalophus californianus*	100 Hz to 60 kHz
	Northern elephant seal	*Mirounga angustirostris*	200 Hz to 2.5 kHz
	Harbor seal	*Phoca vitulina richardsi*	100 Hz to 180 kHz
Mustelids	Sea otter	*Enhydra lutris nereis*	3 kHz to 5 kHz
Testudines	Cheloniid sea turtles	N/A	60 Hz to 800 Hz
	Loggerhead sea turtle	*Caretta caretta*	250 Hz to 1000 Hz

Note: Most of the frequency ranges listed above represent the range of frequencies in which these species vocalize. In a few cases, frequency response ranges are known and are presented. In all cases, the most extreme ranges known at low and high frequencies are noted.

Sources: Au et al. 2000; Lenhardt 1994; Moein et al. 1994; Richardson et al. 1995; Ridgway et al. 1997.

Impact BioMar-11: Entanglement of Marine Mammals and Turtles

Marine mammals or sea turtles could become entangled in construction or operation equipment, causing injury or mortality (Class II).

During the construction phase, divers would help align the HDD pipelines coming out from shore to the offshore pipelines so that they can be connected. In the course of such operations, dive support vessels and perhaps a dive barge would be moored over the HDD pipelines where they emerge from the seafloor in approximately 40 feet (32 m) of water depth. Associated mooring lines, as well as down lines, divers' air hoses, marker buoy lines, and other lines, pose a risk of entanglement for marine mammals

and sea turtles. Due to the size of the proposed offshore mooring system anchor cables, impacts from entanglement are not anticipated.

Numerous marine mammal entanglements in synthetic materials have been documented on the west coast. The most common entanglement is in various fishing nets or lines (Cordaro 2002; Santa Barbara Marine Mammal Center 1976-2004). Entanglements in moorings, crab and lobster trap float lines, and mariculture buoys also have been reported (Cordaro 2002.; Knowlton 2002; Santa Barbara Marine Mammal Center 1976-2004).

In numerous past projects in the region, monitors have been deployed to observe dive operations associated with pipe-laying and repairs, HDD activities, and similar operations. The methodology has been successful, with no adverse impacts on marine mammals and sea turtles (Woodhouse and Howorth 1992; Howorth 1995, 1998b, 1998c, 1998d, 1999, 2001a, 2001b, 2001c; 2002a, 2002b, 2002c, 2002d; Johnson and Howorth 1999 and 2001).

The Applicant has incorporated the following into the proposed Project:

AMM BioMar-9b. **Marine Mammal Monitoring** also applies here.

Mitigation Measures for Impact BioMar-11: Entanglement of Marine Mammals or Sea Turtles

MM BioMar 11-a. Deployment of Potentially Entangling Material. Any material that has the potential for entangling marine mammals or sea turtles shall be deployed only as long as necessary to perform its task, and then immediately removed from the Project site.

Possible slack shall be taken out of any material that could cause entanglement. (It is understood that some slack is necessary to allow for currents, tides, and other factors.)

In the unlikely event that an entanglement appears likely, the monitor shall request the operator to remove all material that could cause entanglement, if possible, and to take up as much slack as possible in material that cannot be immediately removed.

Temporary mooring buoys shall be positioned with heavy steel cables or chains to minimize potential entanglements. Mooring lines shall be used only when vessels are moved, and not left on mooring buoys when not in use.

MM BioMar 11b. Notification. In the unlikely event that a marine mammal or sea turtle is entangled, the operator shall immediately notify the stranding coordinator at NOAA Fisheries in Long Beach (562-980-4017) and the Santa Barbara Marine Mammal Center (805-687-3255) so that a rescue effort may be initiated.

Implementation of these measures would reduce impacts to a less than significant level.

Impact BioMar-12: Release of LNG, Natural Gas, Fuel, or Oil Causes Injury or Mortality of Marine Mammals.

A release of LNG, natural gas, fuel, or oil could cause injury or mortality of marine mammals through direct contact or ingestion of the material (Class II).

Operations

In its liquid state, natural gas can cause frostbite for any organism that comes into contact with it. If there is a major release from the storage tanks on the FSRU, some LNG may bulge, i.e., or form a "bubble" beneath the water surface until it floats to the surface due to its lighter density properties from water. This may increase the vertical distribution of potential impacts to marine organisms from frostbite. Although LNG is stored at cryogenic temperatures, it reverts to a gaseous state upon exposure to air and water. The extent of frostbite to a marine organism would depend upon the actual temperature of the LNG and immediately adjacent air and water to which the organism was exposed as well as on the duration of exposure. The air in the vicinity of an LNG release would cool rapidly and dramatically, but any reduction in sea surface temperature would be extremely localized and short-lived.

Frostbite exposure limits for humans likely have little applicability to marine wildlife. Sea turtles, as reptiles, are extremely vulnerable to colder water, although the leatherback (*Dermochelys* coriacea) can tolerate a wide range of temperatures. Sudden temperature drops can cause cold stunning in turtles, a type of hypothermia in which they quickly become comatose (Spotilla et al. 1997). Frostbite would only exacerbate such situations. Seabirds, although insulated with feathers, would also be vulnerable to hypothermia and frostbite, particularly diving birds, which could become immersed in LNG or exposed to drastically cooled sea water immediately adjacent to an LNG spill.

Marine mammals in general are much more resilient to cold water, particularly larger species such as baleen whales. Some species can tolerate wide ranges of temperatures, from the tropics to the subpolar regions. Some even venture to the edges of ice floes, including California gray whales (*Eschrichtius robustus*). The thick blubber layers of baleen whales provide insulation against intense cold. Even though the vulnerability of large whale species to frostbite from LNG is unknown, it would still depend on the actual temperatures to which they were exposed and the duration of the exposure. Pinnipeds and the sea otter would likely be more vulnerable, if only because of their smaller body mass and thinner insulation, although several species found in this region do occur from temperate to subpolar waters.

In its gaseous state, LNG would displace oxygen from the air and would act as an asphyxiant once oxygen concentrations are reduced below 18 percent. Air-breathing organisms encountering a plume of natural gas can suffer oxygen deprivation when exposed to small quantities (data is not currently available on exposure limits for wildlife) and asphyxiation when breathing concentrated natural gas. The effects of

oxygen deprivation from natural gas on marine mammals (when surfacing) have not been documented, but reduced diving time presumably would be a factor. The speed and endurance of such animals could also be compromised, particularly if they remained in an area where the gas was present. Other effects, such as slowing the buildup of carbon dioxide, which triggers the urge to breathe, could be lethal. Long-term effects are not known.

The extent of impacts from an LNG release depends upon a variety of factors, including the speed of release and dispersion, weather and sea conditions, which affect dispersal, the duration of the release (e.g., a slow leak versus a major tank rupture), the amount of LNG released, and the area impacted by the release. Impacts could vary from insignificant, short-lived effects to widespread impacts possibly affecting significant numbers of marine life.

Worst-case scenarios for human casualties have been modeled for various situations. In the event of a catastrophic failure to one or more LNG tanks, several events may take place. The LNG released could ignite from a variety of causes, producing a fireball with an average height ranging from 46 feet (14 m) up to 197 feet (60 m), depending upon various factors. This fireball could range from a radius of 0.5 NM (0.62 miles (1.0 km) to 1.4 NM (1.61 miles or 2.6 km). Seabirds caught in or immediately above the flames would not survive. Marine mammals and sea turtles caught on the surface in the fireball probably would not survive unless they descended instantly and were able to move well beyond the radius. They could also suffer other effects, including damage to the skin and respiratory system. In the event that such a release of LNG did not ignite, any wildlife surfacing within the concentrated radius would likely be asphyxiated as well as probably suffer from frostbite or hypothermia.

The range at which radiant heat effects (or cold) would affect various forms of marine wildlife is not known, nor is the range at which the gas could produce adverse physiological effects. As discussed earlier, some marine organisms are quite resistant to cold while others have comparatively little resistance. The tolerance of marine wildlife to exposures to natural gas is not known at this time. No data on effects on wildlife are available from past LNG releases.

The effects of hydrocarbon exposure to marine mammals have been somewhat better documented. In general, these effects vary from species to species and with various hydrocarbon compounds. Odontocetes exposed to crude oil sometimes exhibit mild cellular necrosis of the skin (Geraci and St. Aubin 1982; Engelhardt 1983). However, no cetacean mortalities were noted following the 1969 oil spill at Union Oil Company's (now Unocal) Platform A, off Santa Barbara, although the spill occurred during the northbound migration of California gray whales (Brownell 1971). California sea lions and northern elephant seals did not suffer mortality either (Brownell and Le Boeuf 1971; Le Boeuf 1971). Sea otters coated with oil can die from hypothermia because the oil mats the fur, compromising the ability of the dense pillage to trap air for insulation (Costa and Kooman 1982; Engelhardt 1983; Lipscomb et al. 1993). The trapped air also provides some buoyancy so oiled animals expend more energy remaining afloat.

Pinniped pups are born without blubber layers and rely instead upon their dense natal coats for insulation. They would be vulnerable to oil on their coat until they had acquired a blubber layer. Pinniped pups stay at rookery areas and in the immediate nearshore waters for a few to several weeks, however, so a large scale oil or fuel spill would have to spread to the rookery areas to impact the pups. The nearest pinniped rookery to the Project site is at Mugu Lagoon. In addition, small numbers of harbor seals are born at Anacapa Island. The effects of oil on the coats of juvenile and adult pinnipeds appear less deleterious because they retain a blubber layer for insulation. Fur seals, however, rely upon air trapped in their coat as well as on blubber for insulation and so may remain vulnerable to oiling. Emaciated specimens would likely be more vulnerable to oiling. Also, like sea otters, fur seals rely on air trapped in the fur to provide buoyancy.

Ingestion of hydrocarbon compounds can occur when a marine mammal breathes in volatile elements or swallows some oil. The liver and blubber tend to accumulate the highest concentrations of hydrocarbons. These substances may be released from the blubber during lactation, which may affect the young at crucial growth stages. Nonetheless, little is known about the clinical or pathological effects of oil on pinnipeds and cetaceans. Most have not died after exposure to such substances (Moeller 2003). The literature is replete with cautions against assuming a cause-and-effect relationship between exposure of marine mammals to hydrocarbons and other potentially toxic substances. Contaminant levels in tissues do not necessarily equate to contaminate toxicity (Reddy and Ridgway 2003). The greatest difficulty lies in obtaining sufficiently large sample sizes from both healthy and moribund specimens, as well as in restrictions on controlled experiments on living marine mammals (Stein et al. 2003).

Mitigation Measure for Impact BioMar-12: Release of LNG, Natural Gas, Fuel, or Oil Causes Injury or Mortality of Marine Mammals

MM BioMar-5a. Control Measures also applies here.

With the implementation of this measure this impact would be reduced to a less than significant level.

Impact BioMar-13: Lights and Debris from the FSRU Act as an Attractive Nuisance.

Lights and debris from the FSRU and vessels could attract marine mammals, sea turtles, or seabirds, rendering them vulnerable to other impacts such as collision, noise, entanglement, spills, and predation (Class II).

Table 4.4-3 in Subsection 4.4, “Aesthetics,” provides a complete summary of lighting proposed for construction activities associated with installation of the FSRU and offshore pipeline and operation of the FSRU.

A number of seabird species are known to be attracted to bright lights at night. Such animals sometimes collide with lighted objects, causing them to become stunned or to be injured or killed. When they are stunned or injured, they generally fall back into the water, where they fall prey to other seabirds such as gulls and to other predators.

Xantus' murrelet (*Synthiloboramphus hypoleucus*), a threatened species under the California Endangered Species Act (CESA) and a federal candidate, is one of several species of concern. Others include several species of night-foraging storm petrels and alcids. Of these, the ashy storm petrel (*Oceanodroma melania*) and the rhinoceros auklet (*Cerorhinca monocerata*) are California Species of Special Concern.

In addition, bright lights are known to attract numerous marine fauna, starting with plankton, then rippling across the food web to include small schooling fish and squid. These in turn attract larger predators, including fish, seabirds, and marine mammals, rendering each in turn vulnerable to other predators and to other Project-related impacts.

Mitigation Measure for Impact BioMar-13: Construction or Operation Vessels Act as an Attractive Nuisance, Disrupting Marine Mammal, Sea Turtle, or Seabird Behavior

MM BioMar-13a. Construction/Operations Lighting Control. A plan shall be submitted for approval by the USCG and the CSLC with review by local governments at least sixty days prior to construction that shows the Project will apply the following restrictions on lighting, except that lights required by the USCG or for safety purposes shall be used in accordance with Federal regulations by:

- Limiting lighting used during construction and operation activities to the number of lights and wattage necessary to perform such activities.
- Once an activity has been completed, extinguishing all lights used for that activity.
- Shielding lights so that the beam falls only on the workspace and so that no light beams are *directly* visible more than 1000 m distant.
- Limiting lights shining into the water to the area immediately around the vessels, except that searchlights may be used when essential for safe navigation, personnel safety, or for other safety reasons.

Implementation of this mitigation measure would reduce the impact to a less than significant level.

Impact BioMar-14: Construction or Operation Vessels Act as an Attractive Nuisance, Disrupting Marine Mammal, Sea Turtle, or Seabird Behavior

Construction or operational activities could alter sensitive habitats such that marine mammal, sea turtle, or seabird reproduction could be reduced, prey species could be eliminated, or animals might avoid an area (Class III).

Most marine mammals, sea turtles, and seabirds are extremely wide-ranging. The breeding grounds for species of marine mammals do not include areas within the proposed Project site, with the possible exception of some species of oceanic dolphins (e.g., the long-beaked common dolphin), which breed throughout their range, or Dall's porpoise. Oceanic dolphins and Dall's porpoises are distributed across vast stretches of the eastern North Pacific and any interruption of breeding activities would have no measurable impact on populations. Moreover, oceanic dolphins are frequently observed breeding in the presence of boats, so it is not likely that Project activities would have any impacts on breeding activities. The prey of marine mammals are similarly wide-ranging, with the most productive feeding grounds a considerable distance from the Project site (see Subsection 4.7.1, "Environmental Setting").

Avoidance of the immediate area surrounding the Project site by some species is a possibility, particularly during the construction phase, but such reactions would be localized and short-term. Most common species of marine mammals along with several threatened and endangered species have been observed from production oil platforms in the area and it is very unlikely that operation of the FSRU would result in the avoidance of the area by marine mammals. Moreover, the FSRU would be close to a long-established shipping lane where traffic is frequent.

With the exception of the leatherback sea turtle, which ranges from Chile to Alaska, the proposed Project site lies beyond the breeding and feeding grounds of sea turtles. In the case of leatherbacks, none have been reported at or near the proposed Project site. Considering this, as well as the great range of this species, no impacts are anticipated on leatherback habitat or sea turtle habitat in general.

Most seabirds are also very wide-ranging. Nesting and breeding take place on land, so no impacts on reproductive habitat would occur. The feeding grounds of seabirds generally range over very large areas so no measurable impacts on feeding areas or prey are anticipated. Adverse impacts do not meet or exceed the significance criteria. (Class III).

Mitigation Measures for Impact BioMar-14: Temporary or Permanent Alteration or Disturbance of Sensitive Marine Mammal, Sea Turtle, or Seabird Habitats

No significant impacts would occur and no mitigation measures are identified.

4.7.5 Alternatives

4.7.5.1 No Action Alternative

The No Action Alternative means that the Project would not go forward and the FSRU, associated subsea pipelines, and terrestrial pipelines would not be installed. The No Action Alternative would result in no environmental impacts or benefits associated with the proposed Project. Site conditions would remain as described in Subsection 4.7.1, "Environmental Setting."

4.7.5.2 Alternative DWP – Santa Barbara Channel/Mandalay Shore Crossing/Gonzales Road Pipeline

The pipeline route beginning at Platform Gilda and ending at the proposed HDD exit point offshore and the shore crossing at the Reliant Energy Mandalay Generating Station would follow an existing pipeline ROW.

If this alternative were implemented, the FSRU would be located 12.2 NM (14 miles or 22.5 km) from the Channel Islands National Marine Sanctuary. Siting the FSRU in the Santa Barbara Channel would likely result in greater impacts to marine resources, in comparison with the impacts from the proposed Project. The pipeline route for this site would extend across what is known locally as Ventura Flats, a broad alluvium consisting of sedimentary deposits. This broad plain is a productive area for California halibut and other soft-bottom organisms.

This area is also an important feeding ground for California sea lions and Pacific harbor seals, which frequent the area year-round. Sea otter sightings along this stretch of coast are rare. Coastal bottlenose dolphins inhabit the area within 0.5 NM (0.6 miles or 1 km) of shore year-round. California gray whales migrate through this region along several corridors. One corridor runs along the north shores and passages of the northern Channel Islands. Although this route is not within the alternative DWP location, LNG carriers would use the shipping lanes immediately adjacent to this migration corridor. Another migration corridor extends inshore from the shipping lanes, passing very near platforms Grace and Habitat and very close to or across the proposed alternate FSRU site. Still another corridor stretches about 3.5 NM (4 miles or 6.4 km) offshore, near much of the pipeline route. Finally, a nearshore corridor extends from just beyond the surf zone to approximately 1 NM (1.15 miles or 1.9 km) offshore (Howorth 1995, 1998a, 1998c, 1998d, 2001c, 2003).

Several species of oceanic dolphins occur year-round in this region, particularly long-beaked and short-beaked common dolphins and Risso's dolphins. Several other species occur during the cold-water months from late winter to late spring. The minke whale is found in the Santa Barbara Channel year-round, but never in large numbers (Howorth 1995, 1998a, 1998c, 1998d, 2001c, 2003).

The escarpments along the north shores of the northern Channel Islands are frequented by federally endangered rorquals from early summer though fall. These species have been reported throughout the year in the region, but in much smaller numbers. Rorquals that frequent this area include the humpback whale, the blue whale and, to a lesser extent, the fin whale. Humpbacks in particular have been observed near the alternative FSRU location, though not in concentrations. All of these species have been reported near and in the shipping lanes. In addition, North Pacific right whales have been observed twice in the Santa Barbara Channel and sperm whales have been observed on three occasions (Howorth 1995, 1998a, 1998c 1998d, 2001c, 2003).

All of the sea and shore bird species discussed in Subsections 4.8.1, "Environmental Setting," and 4.8, "Biological Resources—Terrestrial," occur at the Santa Barbara

Channel alternative DWP site. In addition, the Ormond Beach wetland area and the Ventura River mouth just north of the pipeline shore crossing forms an important habitat for a variety of sea and migratory birds. The Ventura Flats region is an important feeding ground for the federally listed endangered California brown pelican as well as for other species of seabirds.

Potential impacts to the marine environment along the Santa Barbara Channel route from Platform Gilda to the HDD location and onshore crossing are similar to those identified for the nearshore parts within similar depths. However, the potential for impacts to marine mammals would be higher than for the proposed Project due to their high concentration in the Santa Barbara Channel.

Based on the location of the proposed pipeline for the Santa Barbara Channel/Mandalay Shore Crossing/Gonzales Road Pipeline Alternative from the FSRU mooring point to Platform Gilda, it is expected that impacts to marine birds, sea turtles, benthic species, and marine fish would be similar to the impacts for the proposed pipeline route within similar depth and seafloor topography ranges. The potential for impacts to marine mammals during construction activities may be higher at this location due to the higher concentrations of mammals in this area.

Mitigation measures for potential impacts to marine mammals would include those described for the proposed Project: construction activities outside of known whale migration seasons, marine mammal monitors onboard during construction and installation activities, enforced vessel speed limits, and safety exclusion zones around the pipe-laying vessel for marine mammals to reduce the potential for marine mammal-vessel collisions.

4.7.5.3 Alternative Onshore Pipeline Routes

Center Road Pipeline Alternative 1

Marine biology relates to offshore issues; this alternative relates to onshore activities only and therefore is not analyzed here. See Subsection 4.8, “Biological Resources—Terrestrial.”

Center Road Pipeline Alternative 2

Marine biology relates to offshore issues; this alternative relates to onshore activities only and therefore is not analyzed here. See Subsection 4.8, “Biological Resources—Terrestrial.”

Line 225 Pipeline Loop Alternative 1

Marine biology relates to offshore issues; this alternative relates to onshore activities only and therefore is not analyzed here. See Subsection 4.8, “Biological Resources—Terrestrial.”

4.7.5.4 Alternative Shore Crossings and Pipeline Connection Routes

Point Mugu Shore Crossing/Casper Road Pipeline

Offshore pipeline routes for this alternative would be the same as those identified for the proposed Project. Additionally, the HDD exit point for this alternative is in the same location as for the proposed Project. The entire length of the pipeline from the HDD offshore exit point to the shore crossing at Point Mugu Naval Station would be installed using HDD. The nearshore seafloor and benthic habitats are the same as those discussed for the proposed Project. This alternative would have similar impacts on marine resources as the proposed Project.

Arnold Road Shore Crossing/Arnold Road Pipeline

Offshore pipeline routes for this alternative would be the same as those identified for the proposed Project. Additionally, the HDD exit point for this alternative is in the same location as for the proposed Project: the entire length of the pipeline from the HDD exit point offshore to the shore crossing at Arnold Road near Ormond Beach would be installed using HDD. The nearshore seafloor and benthic habitats are the same as those discussed for the proposed Project. This alternative would have similar impacts on marine resources as the proposed Project.

4.7.6 References

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